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AUTHOR Slattery, Britt Eckhardt
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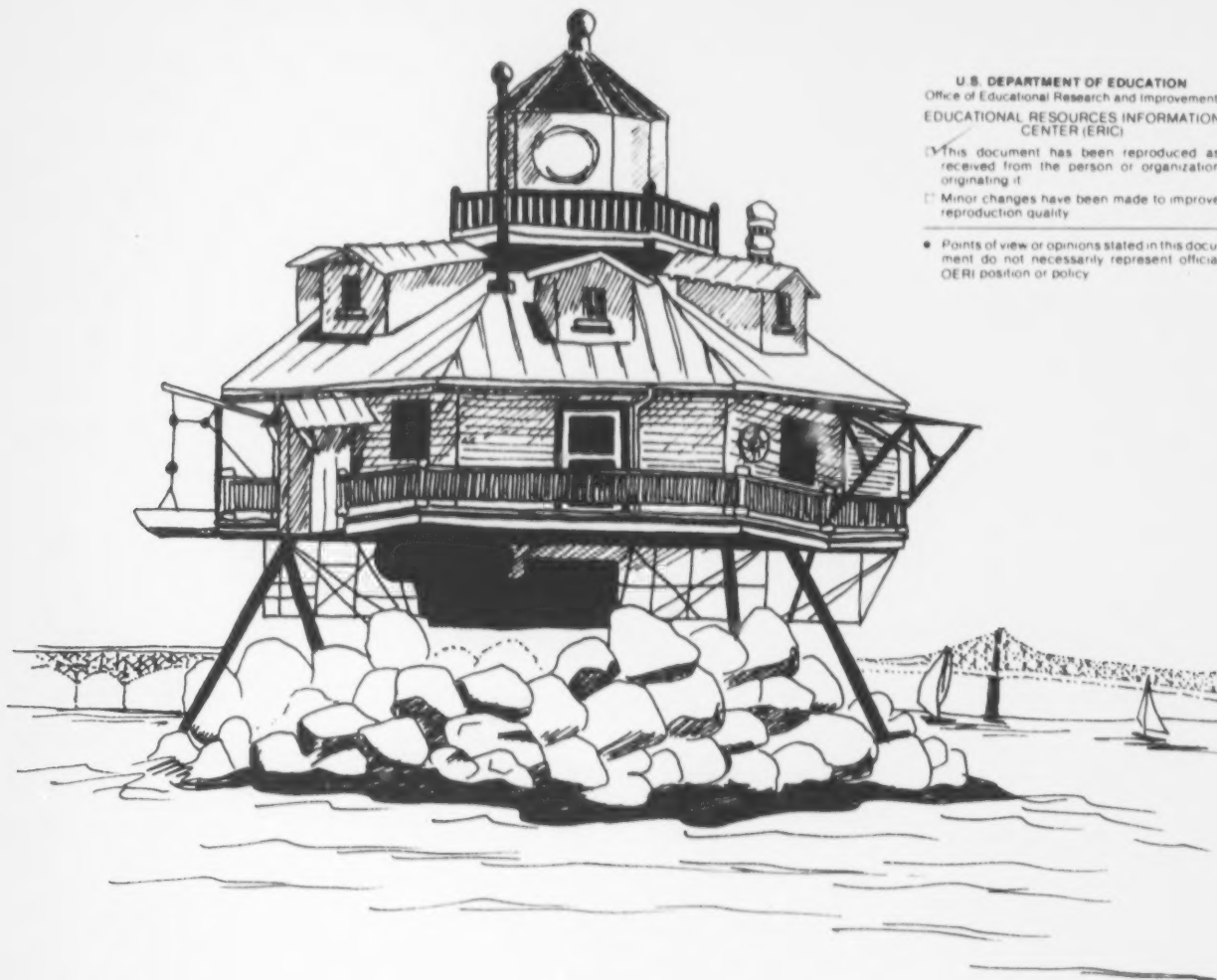
ABSTRACT

The Chesapeake Bay is the largest estuary in North America, providing food and habitat for an abundance of fish and wildlife. This booklet provides lesson plans for lower elementary students introducing the Chesapeake, its inhabitants, and pollution problems, and suggesting ways that individuals can contribute to the Bay's restoration. Background material for teachers is divided into sections on fish, wildlife, and other general Bay information; information about water; and pollution and conservation issues. Each lesson plan indicates grade level, instructional objectives, materials needed, subjects, and student skills. Plans incorporate a variety of disciplines, particularly language skills. Lessons cover the watershed concept; ways in which rain reaches the Bay; plants, animals, and the Bay ecosystem; animals' adaptations to their habitat; Bay food sources; water use, conservation, and pollution; garbage and recycling; and litter from the animals' perspective. Student pages include a coloring book, activity worksheets, and instructions for making fish mobiles and bird feeders. Appendices contain a map of the Chesapeake Bay watershed and addresses of Chesapeake Bay organizations, educational resources, and environmental groups and agencies. (SV)

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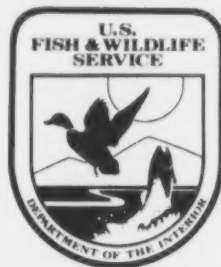
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BAY B C's

A multidisciplinary approach to teaching about the Chesapeake Bay

*This booklet was written, designed and illustrated by Britt Eckhardt Slattery,
biologist for public awareness, Chesapeake Bay Estuary Program,
U. S. Fish and Wildlife Service,
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Introduction

To the Teacher

In recent years, the issue of the decline of the Chesapeake Bay has garnered great amounts of attention. Adults, children, businessmen, farmers, industrialists — citizens wearing any hat — have developed a more heightened awareness of the Bay's valuable resources and the threats to their existence. Federal, State, and local agencies, as well as private organizations, have implemented programs aimed at management and restoration of the Bay and its species.

Vital to the success of these efforts is the cooperation of all individuals living within the Bay's region. Concerned citizens from all corners cry out: "How can we help?" One way is to ensure that the efforts of today are continued tomorrow — by educating our next generation. Our children must learn to nurture the Bay as a resource. This curriculum offers teachers and students an introduction to the Chesapeake, its inhabitants, and its problems, and suggests some ways in which they can contribute to its restoration.

The materials presented in this booklet were developed to provide teachers with readily usable lessons for lower elementary students. Suggested grade ranges have been indicated on each lesson plan, but lessons can be altered to suit the needs of any level. The curriculum may be taught as a complete unit on the Chesapeake Bay, or used in parts to supplement other subjects. An effort has been made to incorporate in these activities a variety of disciplines, particularly language skills. The coloring book has been included as student reading material, and includes activity pages for individual student work. Please reproduce the coloring book or activities as needed for your class.

The background information needed to conduct these lessons can be found in the section entitled, "Our Chesapeake Bay." This article has been divided into three parts, designated by the following figures:



for fish and wildlife and other general Bay information;



for material about water, specifically; and



for pollution and conservation issues.

These symbols will also be found in the upper right corner of corresponding lesson plans.

Teachers are encouraged to involve materials gathered from agencies and organizations in the Bay region — some names and addresses are listed at the end of the booklet.

Take Pride in Chesapeake Bay ... and have fun!

OUR CHESAPEAKE BAY



The Chesapeake Bay is one of our country's most vital resources. It is the largest estuary in North America. Its waters provide food and habitat for an abundance of fish and wildlife. It serves as a highway for commerce, a playground, a storehouse of food. The land that surrounds it provides a home for the 13 million people who live in its region. The main body of the Bay is 200 miles long and as much as 30 miles wide, covering a surface of more than 2,200 square miles. It is fed by fifty major tributaries, which drain 64,000 square miles of land (the Bay's **watershed**), including Maryland, Washington, D.C., Virginia, and parts of New York, Pennsylvania, Delaware, and West Virginia. The Chesapeake is a shallow body of water, believed to have been the Susquehanna River Valley, which was flooded at the end of the last ice age, 10,000 years ago. Its average depth measures less than 30 feet.

The Chesapeake is an **estuary**, a body of water formed at the place where fresh water from rivers meets salt water from the ocean. This mixing results in varying degrees of **salinity** (amount of dissolved salts) — fresh or nearly fresh water at the mouths of rivers, **brackish** or partly salty water throughout the body of the Bay, and the saltiest water at the Bay's opening to the Atlantic. It is the salinity of the water, combined with other physical characteristics such as temperature, that determine which species occupy different parts of the Bay. Therefore, plant and animal populations differ north to south, east to west and from year to year.

What lives in the Bay? Estuaries teem with a variety of plant and animal life. The constant movement of the tides sweeps away wastes and circulates nutrients and food, providing a favorable situation for sedentary animals such as oysters and clams. Estuaries are important nursery grounds for fish. Indeed, many kinds of aquatic animals spend some portion of their life cycles in estuaries. The enormous biological productivity of estuaries is reflected in their immense commercial importance. Another indication of productivity is the constant activity of numerous birds, mammals, and other animals who visit estuaries in search of food.

Most of the living things in the Chesapeake Bay are much too small to see with the naked eye. Microscopic plants and animals, known as plankton, are perhaps the most important species in the Bay. Without them, no other animals would be able to survive. Why? Because all living animals in an **ecosystem** (community of organisms interacting with their environment) need energy in the form of food. Plants and animals continuously circulate energy in a complex network called a **food web**. Plants capture energy from sunlight and use it to manufacture food in the unique process of **photosynthesis**. The smallest plants in the Bay, called **phytoplankton**, float freely near the surface of the water where sunlight is plentiful. Tiny animals called **zooplankton**, which also drift in the Bay currents, feed on phytoplankton, as do many other animals, including the early stages of mollusks (clams, oysters, etc.), crabs, and even some fish species. Small animals, in turn, provide food for somewhat larger animals. Striped bass, ospreys, and people consume the largest animals in the Bay. Through the food web, all animals in the Bay ecosystem ultimately depend on an abundant supply of phytoplankton, and rooted underwater plants.

Nutrients in an ecosystem recycle when a plant or animal dies. Various kinds of **decomposers**, organisms such as bacteria, feed on dead material and animal wastes. As plants capture new energy from the sun and decomposers return nutrients to the ecosystem, organisms in the food web thrive. (Excerpted from "A Chesapeake Bay Primer", U.S. Fish & Wildlife Service)

HOME, SWEET HABITAT Studied out of context, the Chesapeake Bay is an estuary, a body of water. But it is also a part of a much larger system, a region that includes other bodies of water, as well as vast areas of land. Besides water-related areas, the Bay watershed encompasses mountains, forests, and fields. The interaction of this region with its various components, its atmosphere, and its inhabitants is what makes up the character of the Chesapeake.

Different areas of the Bay and its surroundings offer animals a variety of essentials for survival. An animal's **habitat** is the particular kind of place where the animal can most successfully live, find food, water, shelter, and space, defend itself from predators, and find a mate and reproduce. The availability and quality of habitats is an important factor in the health of the Bay and its inhabitants.



Soggy Settings The most vital kinds of habitat found in the Bay region, as well as across the Nation, are **wetlands**. "Wetlands" is a collective term which refers to the different types of areas that are between open water and dry land. They are an interface, a transition zone. The water table in wetlands is at or near the surface (the soil is saturated) or the land is, at least intermittently, covered by shallow water. These areas are identified by the existence of certain plants that are particularly adapted to the stresses of life in wetlands.

Wetlands are found in coastal and inland areas, along rivers, lakes, ponds, inlets, and bays. In the Bay region, there are saltwater wetlands, such as tidal salt marshes or mudflats, and freshwater wetlands, including nontidal marshes, wooded swamps, wet meadows, bottomland hardwood forests, bogs, and some shallow areas of ponds.

Treasured Terrain In the past, wetlands have been given a "bad rap." Often regarded as unproductive areas, and sources of insect pests and unpleasant odors, wetlands have been filled, dredged, or otherwise destroyed in search of more meaningful uses. Today, however, we are realizing the tremendous productivity of wetlands in their natural state. Wetlands are valuable because they:

- * contribute plant material to the Bay food web.
- * nurture wildlife — provide habitat for waterfowl (ducks and geese) and other birds, furbearers, and threatened and endangered species.
- * provide protected nursery grounds for waterfowl and economically important fish and shell-fish.
- * help to control erosion and water pollution by trapping silt and filtering and absorbing chemicals and nutrients.
- * protect upland areas from the destructive power of floods and storms.
- * offer us beautiful recreational areas!

Whose Home? Residents of Bay wetlands may include fiddler crabs, periwinkle snails, oysters, clams, grass shrimp, minnows and other small fish, rails, redwing blackbirds, and many microscopic animals. Throughout the seasons, wetlands may be visited by a variety of animals: dragonflies, blue crabs, shad, striped bass, menhaden, herring, flounder, wading birds (herons and egrets), waterfowl, birds of prey, beaver, nutria, muskrats, or deer.



Sandy Surroundings Another habitat typical to the Bay region is the beach, the sandy or pebbly shores of rivers and the Bay proper. Often flooded and altered by wind, tides or stormwaters, beaches are an ever-changing habitat, so relatively few species settle there. Those that do must be adapted to changes in water level, salinity, and/or temperature. To escape the changing environment, many beach residents live underground, or burrow when the tide is low — certain kinds of clams, worms, insects, relatives of shrimp called beach hoppers. Beach visitors may include gulls, terns and other shorebirds, wading birds, raccoons, or even foxes.



Riverine Realm The freshwater streams and rivers that lead to the Bay are flowing systems of smaller habitats — riffles, pools, and meandering channels. Therefore, they support a variety of plants and animals, many of which are adapted to life within the currents. Rivers are longer and broader than the streams that feed them. The water in these bodies is carried downhill, transported by gravity, ending ultimately at the sea.

Many freshwater fish such as bass, catfish, carp, trout, and sunfish inhabit these waters, along with turtles, frogs, muskrats, otters, wading birds, kingfishers, sandpipers, and other birds. One would also find crayfish, and the water-dwelling larvae (young) of insects such as the caddisfly or copper-colored beetle. Visitors may include raccoons, deer, foxes, or migratory fish, such as shad, herring, striped bass, or perch.



Watery Woodland? Forests, found throughout the region, are familiar to most people. But forested areas along waterways are not often thought of, though they are very important to the health of the water. The zone of trees, shrubs, and other plants bordering bodies of water help to filter and trap sediments and absorb pollutants from the land. These forests house a great variety of wildlife — their plants offer an abundance of food, shelter, and nesting places, and even protective pathways for migrating animals. Turtles, water snakes, minks, otters, beavers, muskrats, deer, squirrels, rabbits, wood ducks, eagles, herons, and songbirds are some that call these forests “home.” Temporary pools formed here are excellent breeding sites for frogs, toads, and salamanders.



Living On the Edge Another valuable habitat is the edge that is formed at the place where different types of plant communities meet. Some examples are the borderline where a forest meets a field or where a shrubby area meets an open grassy area. Some types of edges occur naturally, while others are formed by fire, floods, grazing animals, timber harvest, or the planting of agricultural fields. Edges are usually rich in wildlife because, here, animals can take advantage of more than one community. Some of the animals commonly found in edges are rabbits, deer, quail, pheasants, and various songbirds.

CURATORS OF THE ENVIRONMENT The existence of a diversity of species of animals and plants in the Chesapeake Bay region is critical to the future of our environment. An ecosystem must remain in balance to be healthy. The complex interconnections between living organisms and the environment weave an intricate ecological support system. Systems in balance have the ability to bounce back from most natural disturbances. When a system's balance has been disrupted by human activity, however, recovery may be difficult, if not impossible. This is why we are losing many of our vital resources. *Imagine a child building a tower out of wooden blocks. As blocks are carefully added, the tower teeters, yet finds a balancing point and stands at rest. If the child pulls a piece from the center of the structure, the entire tower crumbles to the floor.*

Indicators of Trouble Like the famous canary in a coal mine, the increase or decline in population of certain organisms can be used to judge the health of the Bay. A recent example is the canvasback duck, an historic Bay species. As the quality of water in the Chesapeake has degraded, **submerged aquatic vegetation (SAV**, or underwater bay grasses) has declined. SAV is a major source of food for canvasbacks. Therefore, as the grasses disappear, so do these ducks. Reduced numbers of canvasbacks in the Bay region is a warning sign that something is amiss in the ecosystem. ***The health of the Bay, in turn, is an indicator of the health of our environment — our land, our air, and our water, all essentials for human health.***

Once a problem is recognized, tracking the cause can be difficult. There may be multiple causes of a single problem, and solutions can be as numerous as the causes. We have to start somewhere. Simple, overall conservation efforts can begin helping a wide range of problems. Continuing preventive measures will help our efforts at environmental restoration.

THE CHESAPEAKE: A LIMITED RESOURCE



WATER: IT'S A FACT OF LIFE! Most of us are aware of the importance of water in our lives. We need water for survival — for drinking, for growing and preparing our food. We need water for bathing, washing clothes, dishes, cars, and cleaning our homes. Much of our recreation is centered around water, whether we go swimming, boating, fishing, crabbing, bird watching, even ice skating or skiing. Many of our livelihoods are dependent upon water. Water, in various forms, covers 80% of the surface of the earth. And water even makes up 97% of our bodies!

Water comes in many forms: solid, liquid, gas; fresh, salty, or brackish. We see it in the form of surface water — lakes and ponds, creeks, streams, rivers, bays and estuaries, seas and oceans. There is also **groundwater** to consider. How are these forms different? How do these bodies of water relate to the land off of which they run? How do human activities affect the land and the water? Which animals and plants are dependent upon water for homes or habitat as well as for their survival? These are questions that can be investigated in the classroom to heighten the awareness of our "future" citizens to the value of water.

Though there seems to be an abundance of water available for our use, most of the water on the earth is salt (ocean) water and is not easily converted to drinking water. What many people do not realize is that what we see is what we get — we can't make water, and there is not a limitless supply of clean fresh water, so what we use is recycled many times. If we were to lose our water supply altogether (and we are beginning to lose it to pollution), it would be very costly, in terms of money as well as energy, to try and restore it. It is important to conserve water now, so we'll have it for the future.

The first step in preserving our water is to understand how water becomes polluted. Most of us have caused pollution, without knowing that our actions were harmful. If people are made aware of what causes pollution, they might try to stop those causes and help to keep our water clean.

JUST WHO IS POLLUTING THE BAY, ANYWAY?



WE ARE THE PROBLEM The fact that we live in a watershed (the land that drains into the Bay) means that our actions on land will affect the water we surround. Many threats to the health of the Bay and our environment begin with one major factor: **OVERPOPULATION**. The Chesapeake's watershed houses about 13 million people. By the year 2020, this figure is projected to be over 16 million. With so many people crowding the land surrounding our vital waterways, the demands are high on the land, the water, and our energy resources.

- The demand for housing increases the development of the land. Forests, wetlands, fields, and shoreline, all critical to a clean environment and to the control of storm-water, are destroyed to build housing and the inevitable accompanying roadways, shopping malls, and other facilities.
- This destruction of land leads to erosion (see below) and reduces habitat area for numerous species of fish and wildlife.
- Increasing numbers of inhabitants means soaring energy needs which further take a toll on our natural resources, and contribute to the acid rain problem.
- A higher population also means greater use of plastics and other materials and products that add to litter and waste disposal dilemmas.

All of these factors act together in reducing the water quality of the Bay and its tributaries. The accumulation of millions of individual "small" acts of polluting, as well as the larger contributions from industry, farming, and development, add up to an unhealthy system.



The connection between land and water When water and substances it collects runs from the land into our water supply, the process is called **RUNOFF**. Manure washes off of the land from our pets, livestock, and gardens. Fertilizers, insecticides, and even oils or salt from streets enter waterways along with runoff.

Many substances, fertilizers in particular, are rich in nutrients, such as nitrogen and phosphorous. These nutrients supply algae and phytoplankton (tiny drifting plants) with what they need for growth. If **excess nutrients** enter the water, too much growth occurs, turning the water into a green "soup" which is unfavorable for the survival of other inhabitants. When the algae die, they fall to the bottom where they are decomposed by bacteria. This process uses up a good deal of oxygen, which means that the oxygen is not available for stationary bottom-dwelling plants and animals. Dead plants and animals, oxygen-depleted water, and lots of bacteria do not make for a healthy body of water!



EROSION is also a prime source of trouble for Bay waters. It is a natural process, but is accelerated by building, wake from boats speeding close to the shoreline, or other types of human activities that disturb the land.

If erosion is natural, how can it hurt the water? Any exposed soil, whether on shoreline or more upland areas, is prone to being washed away by rain or wave action. Soil and chemicals or plant nutrients are carried into waterways. Nutrients dissolve, but large particles settle to the bottom as sediment. Too much sediment smothers bottom-dwelling plants and animals. The remaining suspended particles cloud the water which blocks sunlight that would reach aquatic plants, thereby interfering with their growth. One site can affect other parts of the Bay, since waves and currents distribute these substances.

Is there a solution to the problem of erosion? Erosion cannot be completely stopped because it is a part of the natural evolution of the land. But the process of erosion can often be slowed or even prevented.

- Buffer strips, areas of vegetation along waterways, are helpful. Trees, shrubs, and grasses growing along banks trap loose soil before it reaches the water. These plants also act as filters, removing and using some excess nutrients, such as from fertilizer, that could cause too much algae to grow in the water.
- Bare areas of lawn should be planted with grass, shrubs, flowers, etc. to help hold soil.
- Driveways or walkways constructed of gravel, wood, or other material that allows rainwater to penetrate are helpful in preventing erosion.
- Allowing grass to grow a bit longer before cutting helps to slow runoff which can sweep away soil.
- Wetlands should be preserved at all costs — they are excellent areas for management of stormwater and retention of sediment and nutrients.



WATER ABUSE — pollution from our homes! Let's look at our daily water use habits. When we use water at home, most of it goes down a drain and then it's forgotten. If your house is connected to a public sewer system, after leaving your sink or tub or toilet, the water, and any soaps, chemicals, etc. that may be with it, travels through sewer pipes to a **wastewater treatment plant**. Here, water and wastes are filtered and treated before the residual clean water is sent back to a creek or river which eventually leads to the Chesapeake Bay. Wastewater treatment plants are built to handle a certain amount of water and waste. With increasing population, and with excess water use,

the plants become overloaded and cannot effectively treat the water before discharging it. If the various chemical and biological wastes that we put down our drains cannot be removed from the wastewater, these pollutants will end up in our water supply — lakes, creeks, rivers, and the Bay!

If your home has its own septic system, water and wastes are carried to an underground tank where solids settle out and are broken down by bacteria into less harmful substances. Then the remaining water is carried to a drainfield — an area of your property where the water filters out into the ground. Here, it will be mixed with groundwater and will eventually be carried to a nearby water source, such as a creek. Chemicals that we often dump in our sinks, such as drain cleaners or unused pesticides, will contaminate the groundwater. These chemicals will also kill the bacteria that "clean" the wastewater. Without this bacteria in the tank to break substances down, harmful wastes leach out into the groundwater and make their way into tributaries and the Bay.

How can we help? It's simple! First, use less water. If we do not overload treatment plants or septic tanks, they can do a better job.

- Turn off the faucet while brushing your teeth.
- Take short showers instead of baths.
- Run washing machines or dishwashers only when full.
- Wash dishes in a sink full of water, not under a running faucet.
- Water your lawn sparingly. Check the weather forecast, first — if it's going to rain, why waste water?

Second, remember that where your water goes, so goes anything else.

- **Never** dump poisons down the drain! This includes old paint and turpentine, motor oil, fertilizers or insecticides and the like. These substances will not be removed from wastewater, and will pollute the waterways.
- Remember that many stormdrains lead directly to a natural water source — they are only for directing rainwater, and have no means for removing chemical waste.



WASTE is a growing problem in the Bay region. There are different kinds of waste to consider, in general, "**man-made**" and "**natural**" waste. Most man-made waste is made up of trash (including litter) — plastic, paper, glass, metal, and other solid items. Some kinds of man-made materials become hazardous waste, or chemicals that may be harmful directly to plants, animals, and people. Natural waste refers to food substances, human wastes, manure, and other matter which is easily broken down. Some of these materials can be harmful to the environment in more indirect ways.

Litter is ugly, but how else could it be harmful? Plastics and other non-biodegradables that become "litter" are not only unsightly, but can also be detrimental to the health of wildlife. Some of these materials are mistaken for food, while others entangle, trap, and strangle animals (particularly aquatic species). Litter also clogs the flow of streams and interferes with both aquatic and terrestrial habitats. With solid waste production growing by tons, the problem of disposing of it without impact to the environment is becoming harder to solve. Many communities offer recycling services for paper, glass, aluminum and other metal products. Recycling materials saves natural resources, takes less energy than the manufacture of new materials, and helps to reduce litter.

Hazardous waste, a scary term: Toxic or hazardous waste is a more serious factor endangering the health of our environment. Industries have been blamed for discharging toxic chemicals to our air and waterways, but many are now meeting restrictions on the cleanup of wastes before they are released to the environment. Hundreds of thousands of tons of hazardous waste are generated yearly in Maryland alone, not just by industry, but also by government, hospitals and laboratories, businesses, and average citizens.

Many household products, such as cleaning agents, pesticides, oil based paints, are poisonous or caustic to people, plants, and wildlife, and therefore contribute to the overall pollution of the environment. Hazardous waste from homes reaches the environment in several ways. Dumping harmful chemicals down the drain is one way. Disposal — by intentional or accidental means (illegal dumping, leakage or spills) — directly to the ground or into stormdrains causes toxic substances to be washed by rainwater to natural waterbodies.

So how do we stop pollution from wastes? As individuals, we must take a careful look at the products we use and the ways in which we dispose of them. Reading labels will help you to know which products are harmful. Fertilizers and other lawn care products should be used only according to package directions, and never just before it rains. Using the correct amount of these materials can help save money, and reduce nutrient loads in the water. Unused portions of some potentially harmful products should be carefully contained to prevent leakage and taken to a landfill. Others can be shared with a neighbor. Used motor oil should be taken to a service station for recycling (improper disposal of motor oil is illegal). Check with a local environmental agency to see if your area offers services for hazardous waste collection.

In general, we should think about the possible dangers to the environment before we dispose of any trash, poisons or natural materials. More specific help with disposal dilemmas can be gained from local experts (see resource list, pages 62-63).

WE CAN BE THE SOLUTION Pollution is caused by a variety of factors, but we can all take action to help. Just as millions of small individual actions can add up to harm the Bay and the environment, millions of small helpful actions (one or two by each of us) will have a very positive effect! It boils down, simply, to taking individual responsibility for the health of the Bay, thinking carefully and changing our daily habits.

What's A Watershed?



Students assist with a "working" model of the Chesapeake Bay watershed. Grades (1)-3

Objectives

- recognize that rivers and streams are connected to the Bay, and that water quality is affected by the condition of the land
- become aware of at least part of the water cycle
- use a simple map to locate bodies of water, towns, etc., and to trace the path of a local tributary.

Materials

- aluminum foil
- large rectangular pan or basin
- two chalkboard erasers, wooden blocks or bricks
- food coloring
- small amount of loose soil or sand
- water
- watering can with "shower" spout, or several small paper cups with holes punched in the bottom (Note: test prepared cups to be certain that surface tension of water does not prevent flow through holes)

Subjects

Science, social studies.

Skills

Discussion, inference, interpretation, kinesthetic concept development, mapping, observation, prediction.

Procedure

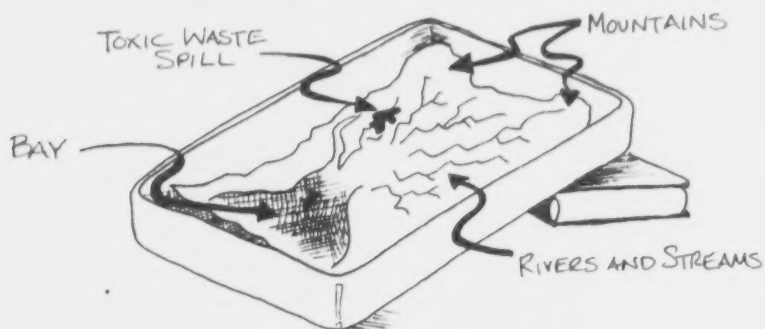
1) Review a simple idea of the water cycle. Then, introduce the class to the idea of a watershed (all of the land that sends water into a particular body of water). Stress the fact that by living in the Bay's watershed, we are connected to the Bay, even if we seem to live far away from the water. Begin with a simple map of the Chesapeake Bay (depending upon ability level of the class). There is a watershed map at the end of this booklet.

- * Locate and name large rivers and familiar towns; point out the Atlantic Ocean.
- * Find and mark the location of the school on the map. What is the nearest river or other body of water?
- * Can the students trace that body of water to its source (beginning)? —to its connection to the Bay?

2) Ask: * Can you think of any ways that the water could be changed as it flows from its source to the Bay? Make a list. There could be many answers, but lead to impacts from human actions and from substances (natural or man-made) that run off of the land — remember to note cities, towns, and natural areas through which the water flows.

3) To illustrate the watershed concept, set up the model as follows: Tear off a piece of foil to just fit inside the pan. Crumple the foil to make dips and gulleys to represent stream and river beds. At one end of the foil, form a larger basin or pocket — this will be the Bay and will collect water that runs from the tributaries. Place blocks in the corners at the other end of the pan to make mountains (shape the foil over the blocks), and make a valley between them; raise this end of the pan a bit higher than the end with the "Bay". Explain to the class what the model represents, noting that higher elevation or bumps in the foil are areas of land, while cracks and dips are bodies of water.

4) Students will make it "rain" with the cups filled with water, or the teacher will produce "rain" using the watering can. Observe how the water runs off of the land, into the tributaries, and eventually into the Bay.



5) Next, make a "toxic waste spill" with a drop of food coloring nearer to the source of the tributaries (use a familiar town named earlier as an example). You may want to use a more relevant example, such as someone in the town changing motor oil and dumping the used oil into the street.

* What do you think will happen to the "spill" when it rains? Make it rain again and watch how the rainwater carries the "poison" to tributaries and the Bay.

* What are some other man-made pollutants that get into the water this way?

6) Now pretend that someone builds his/her home too close to the bank of a body of water. The bulldozer clearing the land loosens soil (place a small pile of soil or sand in your model). Make it rain again, and watch how the soil is washed away. Let it rain until the soil collects in the Bay and settles to the bottom. This loose soil in the water is called sediment.

* What effect would a large amount of sediment have on a river? On the Bay? On the plants and animals living in these waters?

7) Name some ways to prevent these harmful events from occurring.

This activity was adapted from *River Times*, published by the Mathematics and Science Center, 2401 Hartman Street, Richmond, Virginia, 23223. A copy of the curriculum may be purchased for \$30.

OH! CHESAPEAKE!

Sung to the tune of 'Maryland, My Maryland' or 'O! Tannenbaum'

Chorus: Chesapeake, Oh Chesapeake!
Your waters are so lovely!
Chesapeake, Oh Chesapeake!
Your waters form an estuary!

(Make wave motions with hands)

Verse 1: With water from the rivers wide,
And water from the ocean-side.
Oh Chesapeake, Oh Chesapeake!
We love to have you near us!

(Point to ceiling - rivers come in from the North - then point to floor - South)

(Fold arms and hug yourself)

Verse 2: You give us food, and jobs to do,
And we can swim and fish in you!
Oh Chesapeake, Oh Chesapeake!
You provide so much for us!

(Make eating motions)

(Make swimming/casting motions)

(Hold out cupped hands together)

Verse 3:
You're home to ducks and fish and deer,
Alas, but there's a problem here!
Chesapeake, Oh Chesapeake!
We want to help protect you!

(Pretend to be looking through binoculars)

(Back of hand to forehead)

(Move arms as if cradling a baby)

We'll use less water, just for you!
Recycle cans, and paper, too!
Chesapeake, Oh Chesapeake!
What would we do without you?

(Pretend to turn off faucets)

(Shake scolding finger)

(Arms out, palms up - "I don't know"-style)

Repeat Chorus

PATHWAY TO THE BAY



A two-part activity:

- Students observe rain to view its effect on the land. Grades K-3
- Students take a walk around the school grounds (or the school's neighborhood) to find the closest connection to a water source. **Note:** It may be wise to "scout out" an area ahead of time. Grades (1), 2, 3

Objectives

- recognize that water travels from place to place and can be affected as it moves along
- discover that water (rainwater, creeks, streams, etc.) is our connection to the Bay
- become aware that we can help or harm the Bay through our treatment of any water source.

Materials

- simple map of area around school
- map of larger area around school (state map) which includes all or part of the Bay
- paper and pencils
- copies of "connectors" chart
- coats, etc., depending upon weather.

Subjects

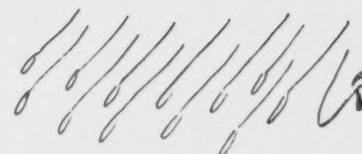
Science, social studies.

Skills

Discussion, hypothesizing, identification, inference, mapping, observation.

Procedure

PART I: FOR A RAINY DAY



Where Does the Rain Go?

*Where does the rain go
when it falls on the land?
It makes plunking noises on
our roof
and forms a puddle in my hand.*

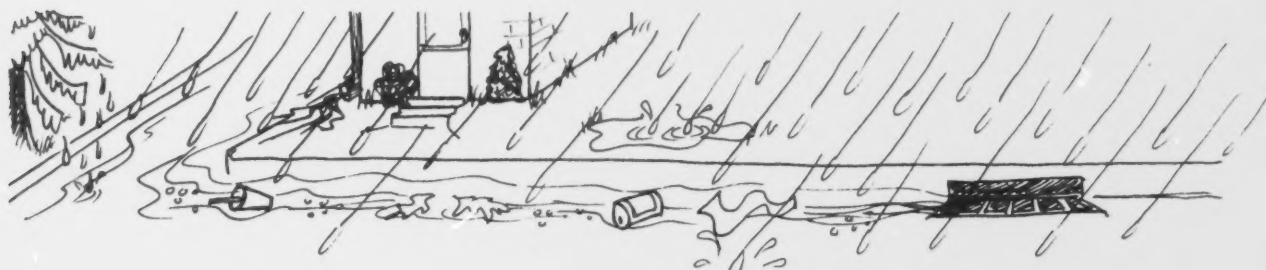
*It dribbles down the windows
and trickles off our door.
When it gets on my galoshes
it makes puddles on our floor.*

*It plops on all the grass and trees
and makes the flowers grow.
I can watch it flowing down the
street,
but then where does it go?*

*I think that all those drippy drops
have traveled here and there.
And when they've finished raining
here
they'll meet again somewhere.*

1) Read aloud the above poem. Ask the students if they can guess where the rain goes. Explain that they will be observing the rain and looking for ways that the rain changes things on the land. **Questions to answer** while looking out of the window (students will need pencil and paper):

- * Write a word that describes how the rain makes things look (wet, shiny, muddy, droopy,...).
- * List some things that rain washes away.
- * What do you see floating in the rainwater?
- * Find a place where rain is dripping from a building or other object. What is happening to the ground where the water lands?
- * Can you find any places where the rain is forming a body of water?
- * Can you find any places where the rainwater is joining a creek or other body of water?



2) After the class has finished the above, discuss their answers and observations.

- * Does the rain change the land?
- * Does the land change the water in any way?

3) Review with the class the idea that we live in a watershed. Even if the school seems far away from the Chesapeake Bay, you are connected to the Bay by all of the nearby creeks and streams (yes, even in the city!) that join the Bay. The rain that you observed also joins the Bay in this way. Many things that are carried by rain will also get into these bodies of water.

- * What sorts of things could water pick up as it runs through the land? (soil, leaves, trash, spilled oil or other chemicals...)
- * Could some of these things harm the water or the animals that live in it?

PART II: THE DAY AFTER IT RAINS — MAKING THE CONNECTION

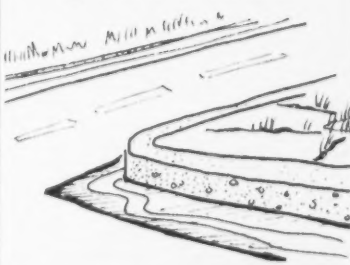
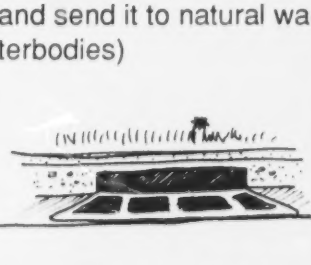
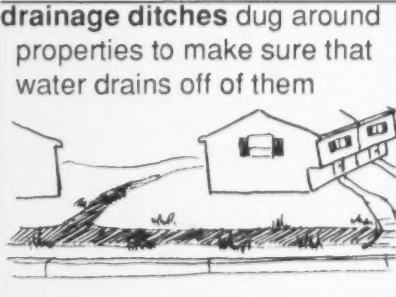
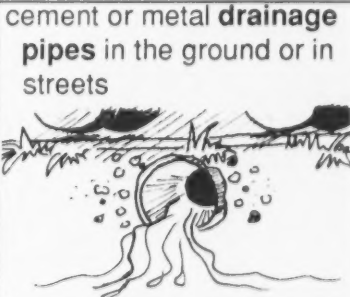
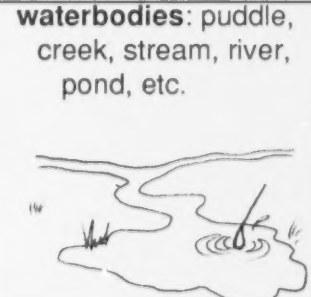
1) Ask the class to review some of the things that were discussed in Part I.

- * Why is it important for us to know our connection to the Bay? (...because many of us don't see the Bay itself every day, and we don't realize that our actions affect the Bay... if we know how we are hurting the water, we know what to change to help the water)

2) Explain that in this part of the exercise, the class will be going outside on an expedition to look for their connection(s) to the Bay. Prepare with the class a simple map or diagram of the "expedition site" —the schoolyard and its surroundings, marking landmarks. Ask if any of the children live very close to the school, and mark some of those houses on the map. Or you may wish to limit the map to the school grounds alone.

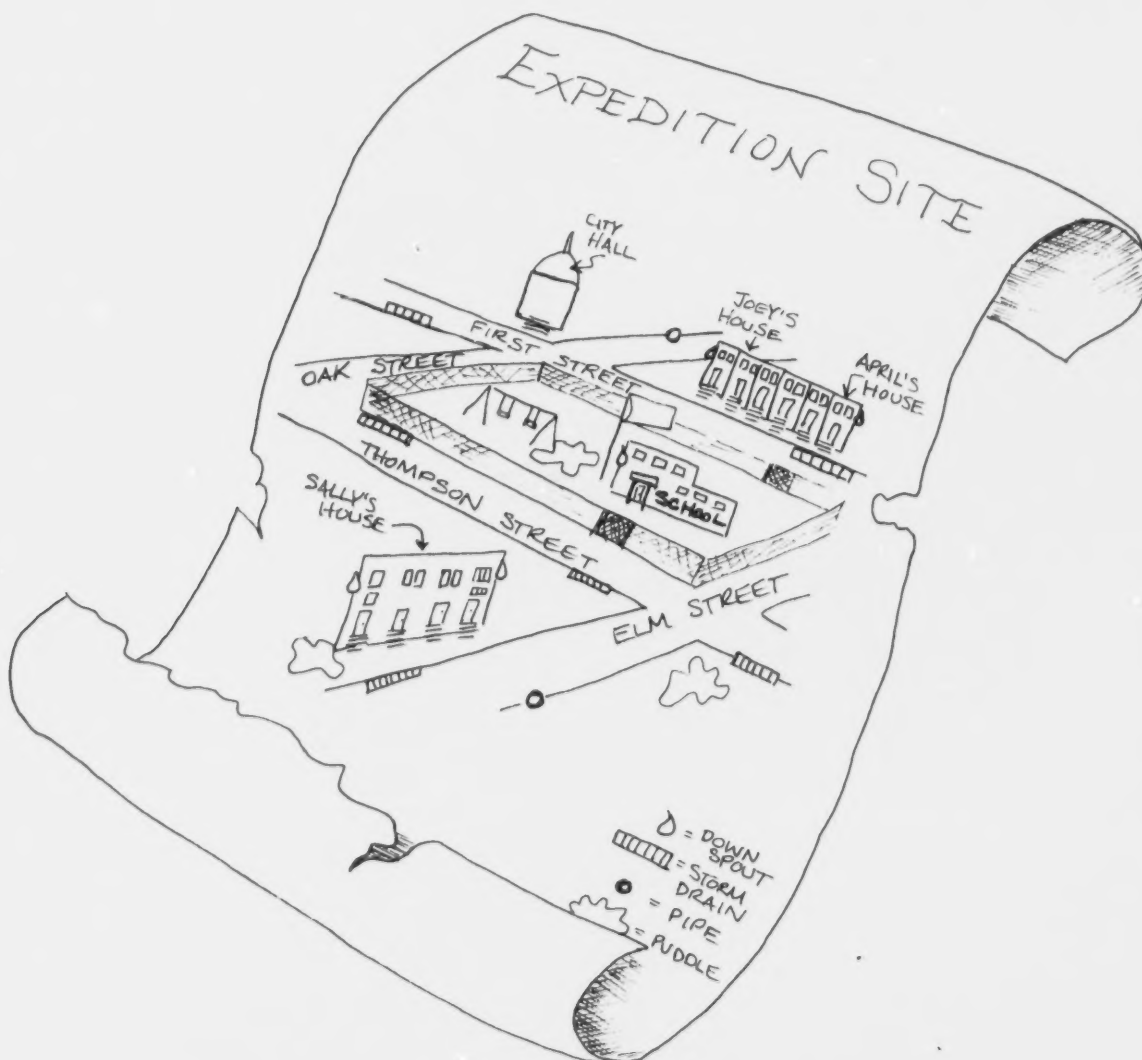
3) Hand out and read through the list below of connection signs to look for. These are things that collect water and direct it somewhere else. As each item is found, mark its place on the map.

"THE CONNECTORS"

downspouts on buildings 	gutters in streets 	stormdrains (collect water and send it to natural waterbodies) 
drainage ditches dug around properties to make sure that water drains off of them 	cement or metal drainage pipes in the ground or in streets 	waterbodies: puddle, creek, stream, river, pond, etc. 

- 4) Back in the classroom, display the map for study. Review each symbol on the map.
- * Can you trace where any of the downspouts, gutters, drainage ditches or pipes lead? Were you able to tell where they were sending water?
 - * Did any of the above lead directly to the stormdrains or waterbodies (if you found any)?
 - * Where do you think the stormdrains lead?
 - * Did anyone find any soil, oil, or trash in the water or in the "connectors"? Where do you think these materials came from? Where do you think the water and these materials will end up?
- 5) Locate and mark the school and the area studied on a larger map.
- * Can you find the nearest stream or other waterbody on this map? These are where the "connectors" eventually send their water.
 - * Have students trace the flow of these bodies of water from the school all the way to the Chesapeake Bay.

**** Why is it important for us to keep trash and other pollutants away from water?**



BUILD A BAY BULLETIN BOARD



Students color and cut out "3-D" figures to add life to a Bay backdrop. Grades K-3

Objectives

- visualize some of the components of the Bay ecosystem
- distinguish between some aquatic and land-dwelling plants and animals
- discuss relationships between humans and natural resources.

Materials

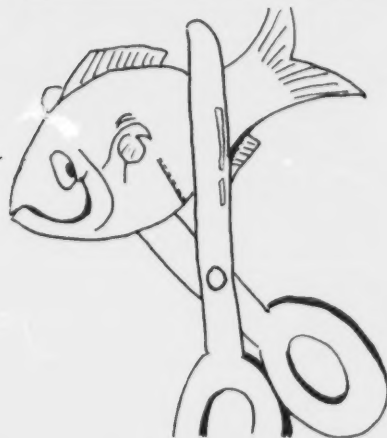
- copies of pages 17-18
- scissors
- glue, paste or clear tape
- crayons
- (rolls of) colored construction paper for bulletin boards.

Subjects

Science, social studies, art.

Skills

Discussion, drawing/crafts, identification, matching.

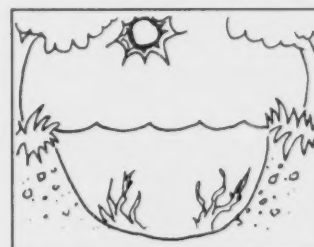


Procedure

1) Prepare a background scene to represent an aquatic setting (the Bay) — see diagram. Include a large area of water with land on both sides or shores. Add some trees to edges of bulletin board, to help students remember that land and water are connected. Be sure to give the Bay a bottom surface, and include some underwater grasses to provide food and cover for the animals.

2) Discuss with students the relationship between land and water.

- * How is water different from land?
- * Where on land do we find water? Do we ever find land in (on) the water?
- * Does water ever make changes in the land (hint: rain)?
- * Imagine a land without any water at all. What would it be like? Would plants live there? Would animals live there? Would people live there?
- * Make a short list of some kinds of plants and animals that would be found on land near the water; make another list for those found in or on the water (hint: see page 19).

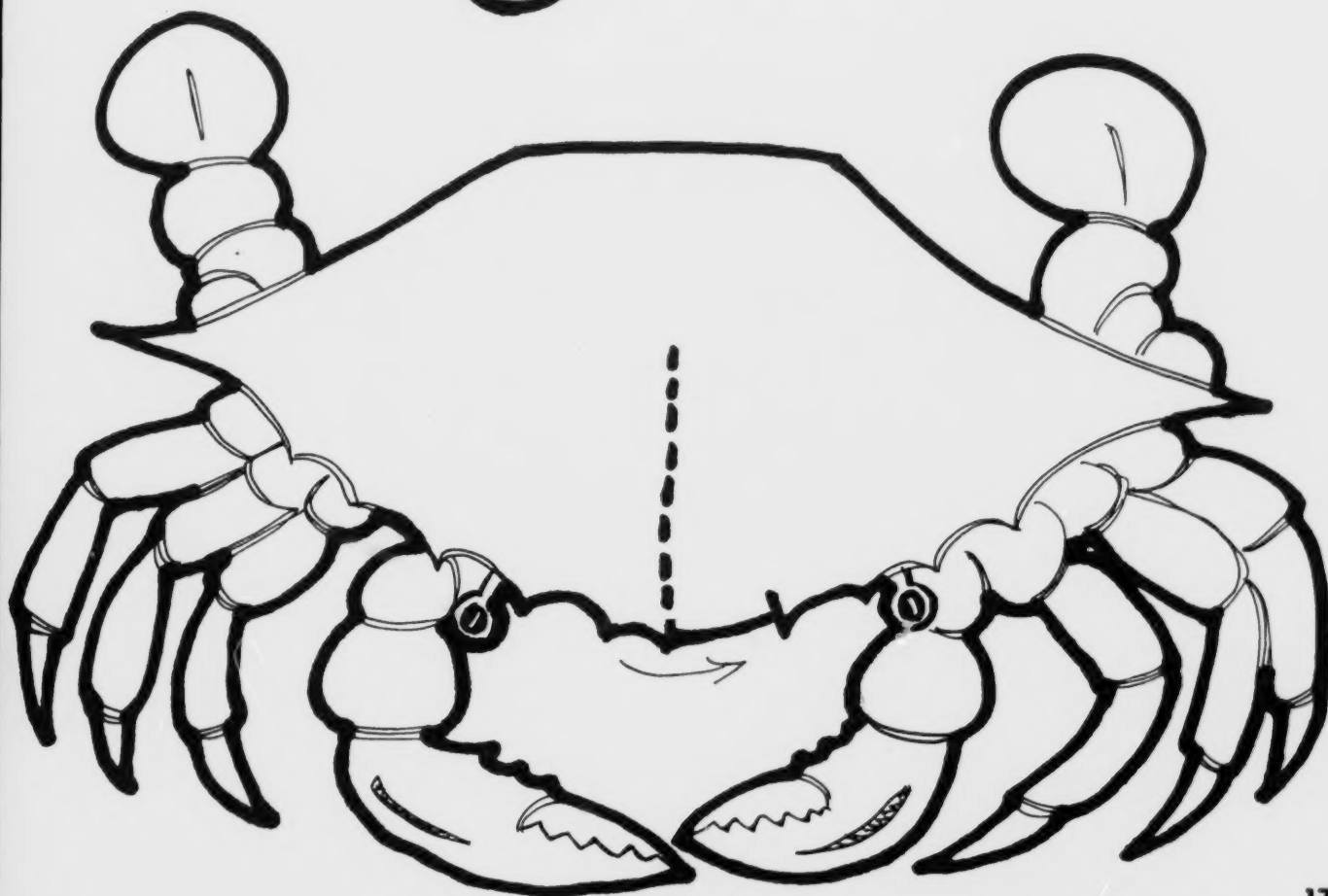
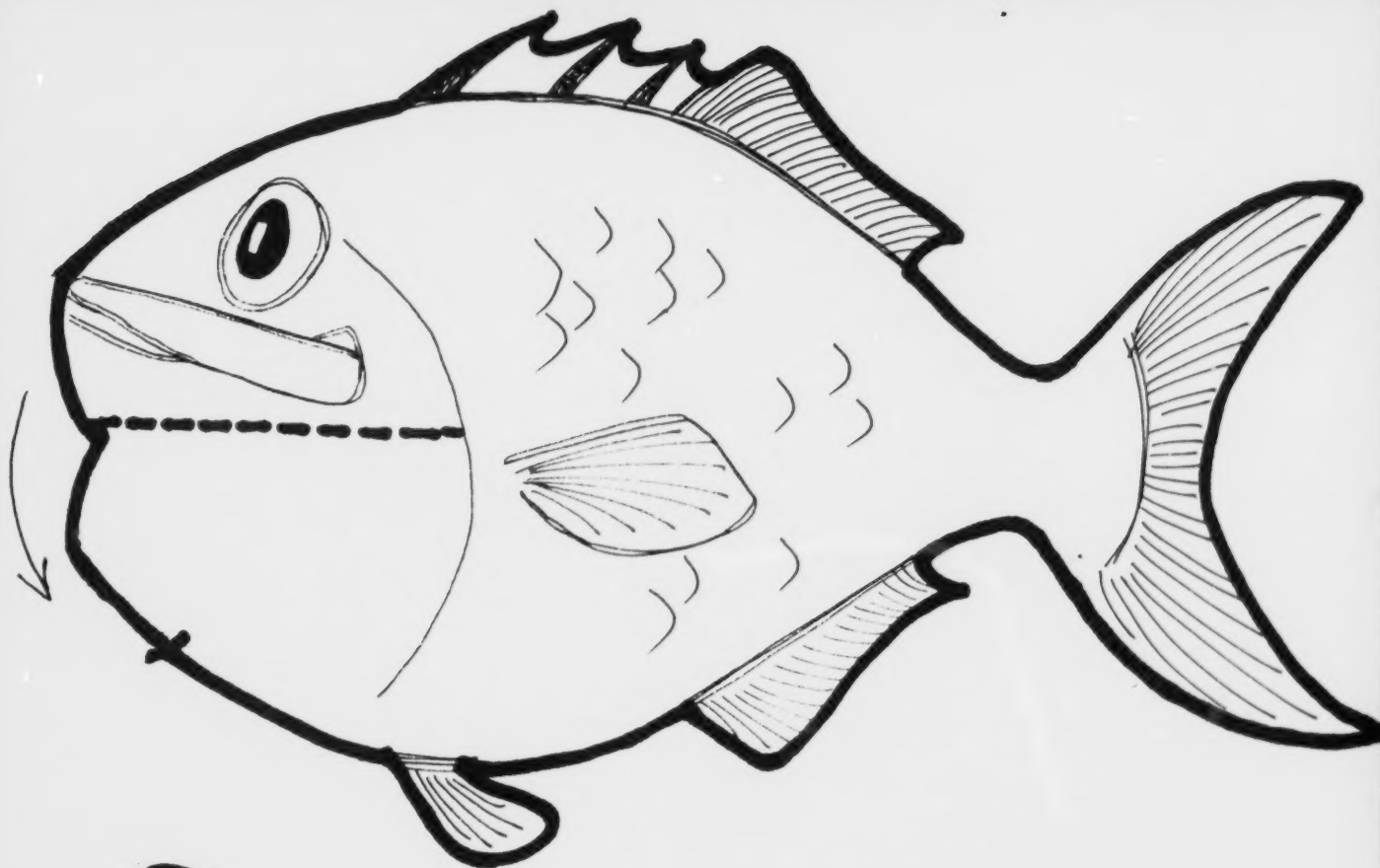


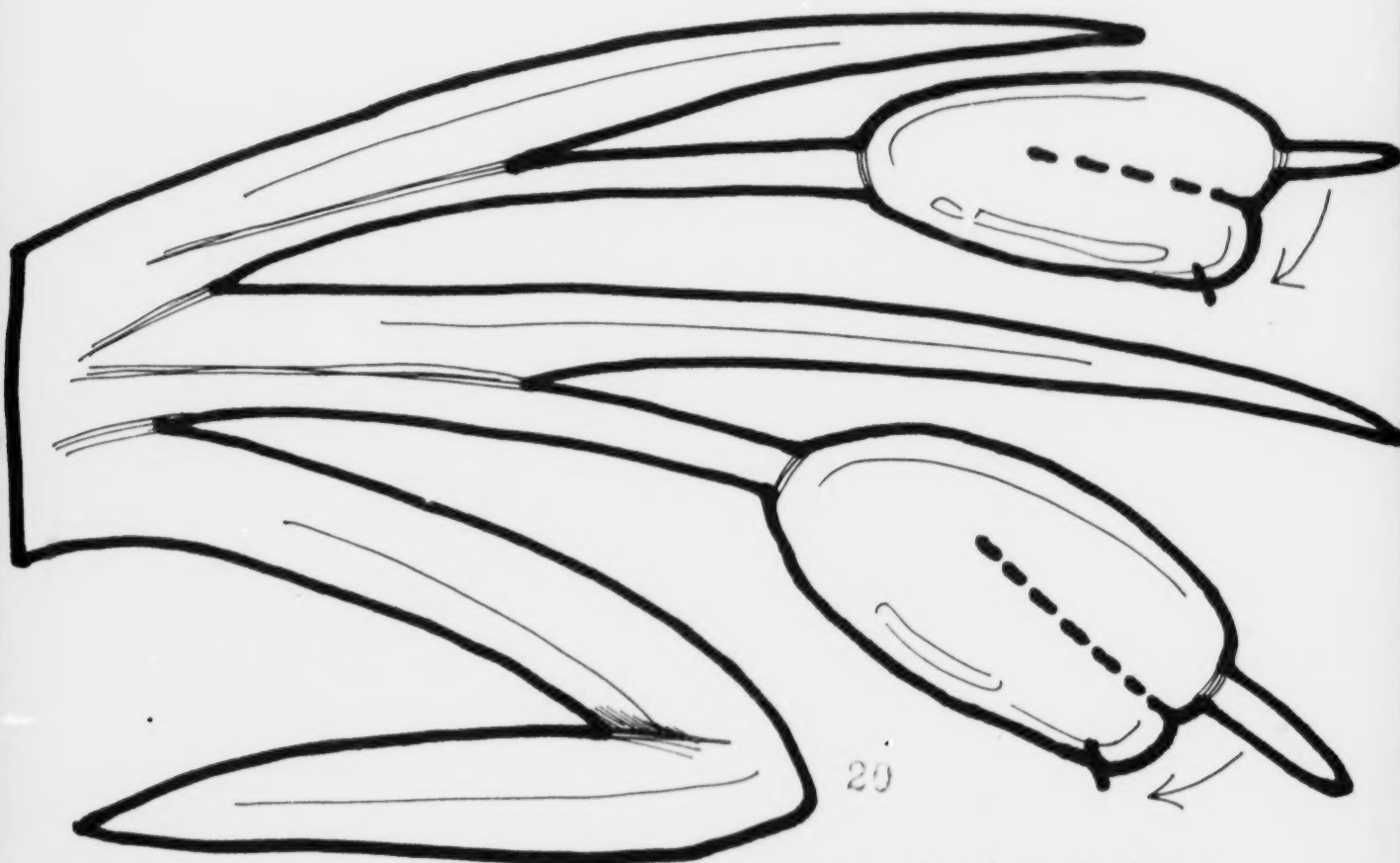
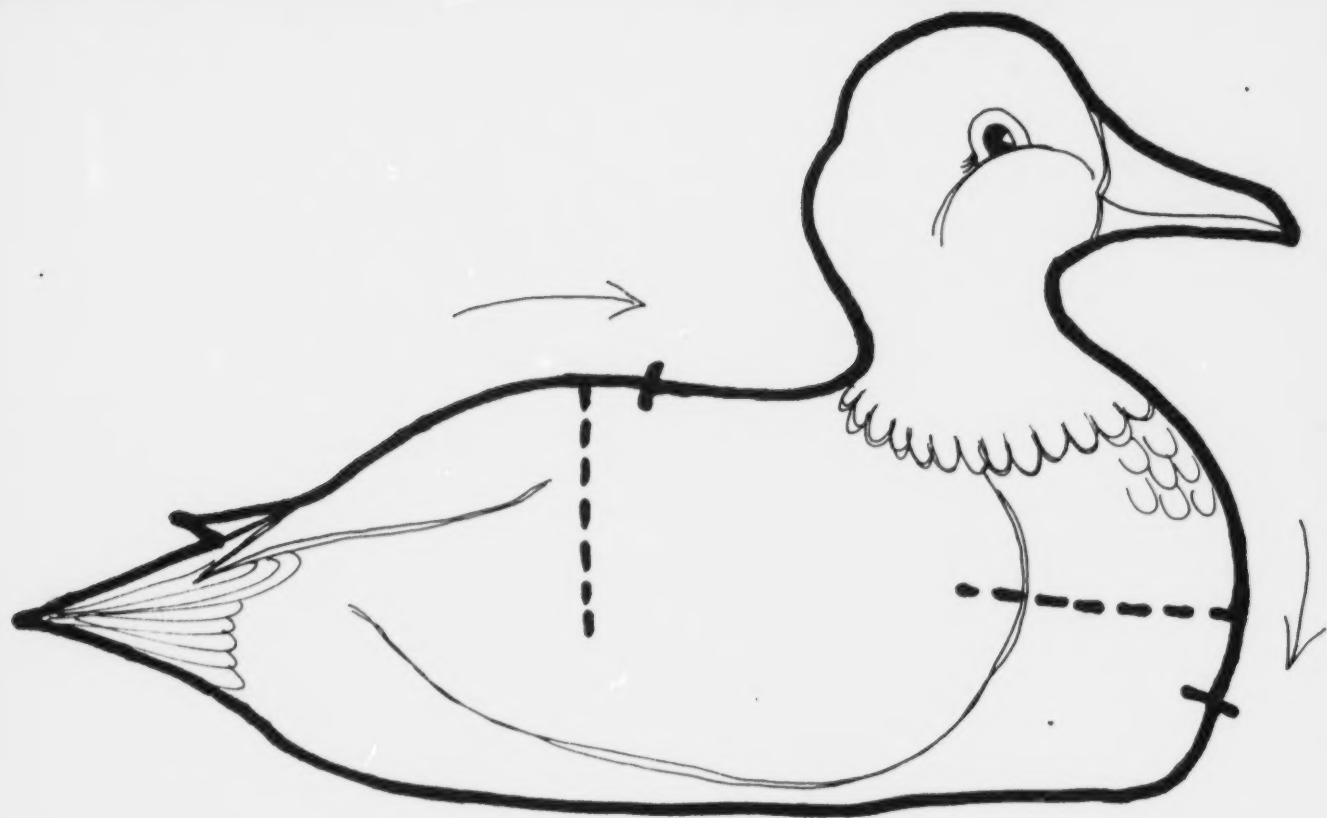
3) Pass out copies of the cutouts provided (one or two per student). Have the students color the figures, then cut them out along the heavy outline. To make the figure stand out, cut a slit along the dotted line and lap the edges over in the direction of the arrow — match the edge of the top piece to the mark on the bottom piece. Fasten in place. When the figures are complete, have the students find spots for them to be attached to the backdrop.

- * Where would people fit into this scene? Draw yourself using water (fishing, swimming, boating, drinking, washing, etc.), and label your drawing. Add these drawings to the board.

Questions for (advanced) discussion:

- * What changes do people often make to land (clear trees to build houses, leave trash, etc.)? Have the class decide which changes are "good" and "bad."
- * How might these changes affect animals that live there? — How about plants? Do you think these changes could affect the water? How?





ALPHABET SOUP



Students name and draw plants, animals, etc. that relate to the Bay to make an alphabet banner for the classroom. Grades K-3, as appropriate.

Objectives

- familiarize students with the variety of living things in and around the Bay
- match letters or sounds to names of things, or (for older students) spell these names.
- visualize and draw the words listed.

Materials

- (large) pieces of drawing paper
- crayons
- alphabet stencils or other large letters for display
- chart of Bay animals, etc., provided
- (optional) magazine pictures of Bay plants and animals.

Subjects

Language (spelling), art.

Skills

Classification, drawing, identification, listing, visualization.

Procedure

1) Begin by asking the class to brainstorm a list of words relating to the Bay. Start with the letter "A" and proceed through the alphabet. It might be helpful to work by category, for example, "Think of an animal that lives in the water, whose name begins with 'A'," or, "Name something that begins with 'B' that's found on the land." For younger children, show a photo and ask for the subject's name. With what letter or sound does its name begin? The large letters can be used for a matching exercise. Make a list of the words on the board (see sample lists).

2) Next have students choose a word to illustrate (if you have used magazine pictures, pass them out for help with visualizing the words). Older students should label their drawings, making sure that spelling is correct; the younger ones may need the teacher to label for them.

3) When the drawings are completed, the class can help to put them in alphabetical order. Hang them beside the large letters to create an alphabet banner.

4) As an added exercise, older children may write sentences using these words.

Aquatic Words	Birds	Mammals	Plants	Others
alewife • anemone	bird • canvashack	cow	algae	animals • boats
barnacle • bass • bay	duck • eagle	deer	flowers	Delaware
bluefish • catfish • carp	egret • falcon	fox	grasses	dragonfly
clam • crab • creek	geese • gull	goat	lichen	fossils • insects
Chessie • drum • eel	hawk • heron	Indian	lady's slipper	island • land
estuary • fish • flounder	ibis • kestrel	muskrat	plants	Maryland
frog • herring • horseshoe	kingfisher	nutria	SAV	mosquito
ice • jellyfish • killifish	mallard	otter	(Submerged	Native American
lake • marsh • menhaden	marsh hawk	people	Aquatic	nature • New York
minnow • needlefish	night hawk	vole	Vegetation)	nutrients
oyster • perch • pipefish	osprey	you!	trees	Pennsylvania
ray • river • rockfish	oldsquaw		vegetation	pollution
shad • shells • shrimp	peregrine		wild rice	snakes • skipjack
snails • squid • stream	pigeon • quail		wild celery	vacation • Virginia
toadfish • trout • turtle	rail • redwing			Washington, D.C.
terrapin • underwater-	scoter • scaup			West Virginia
grasses	sandpiper			wetland • wildlife
York River • zooplankton	widgeon			Yorktown



A Host of Habitats



Students create scenes of Bay habitats by pasting pictures of animals to background scenes.
Grades (K) 1-3

Objectives

- recognize and discuss the variety of habitats found in the Bay region
- learn about the plants and animals that can be found in these areas, and discover their importance to the environment and to people
- match animals to habitats.

Materials

- copies of pages 21-23
- crayons
- scissors
- glue or paste
- photos or magazine pictures of animals and/or habitats.

Subjects

Science, language (vocabulary), art.

Skills

Classification, description, drawing/coloring/cut & paste, identification, listing, matching, use of library references, visualization.

Procedure

1) Begin with a general discussion of the Chesapeake region. Use the photos to help them envision what they're discussing.

- * What do the students already know about the Bay and its resources?
- * What kinds of places have they seen (or might they see) around the Bay? List or draw these places on the board (forest, beach, marsh, etc.).
- * Name some animals that might live in these places; add these to the list, or make a chart (two columns: "habitats" and "animals").

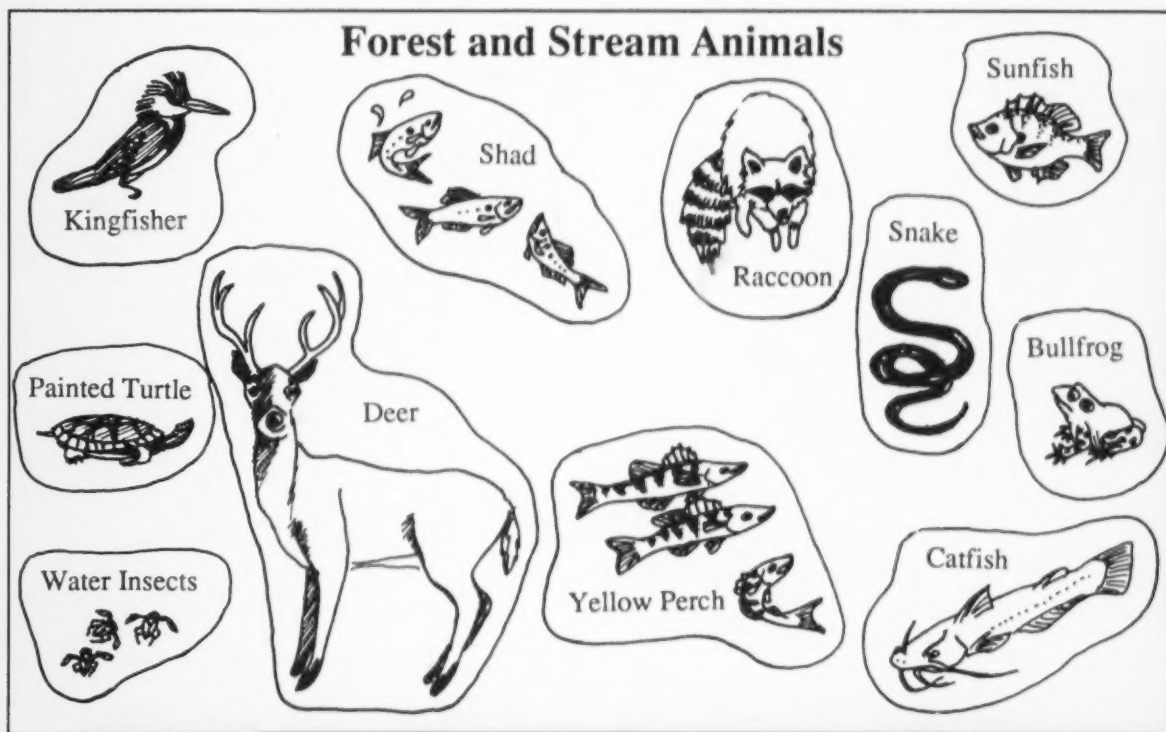
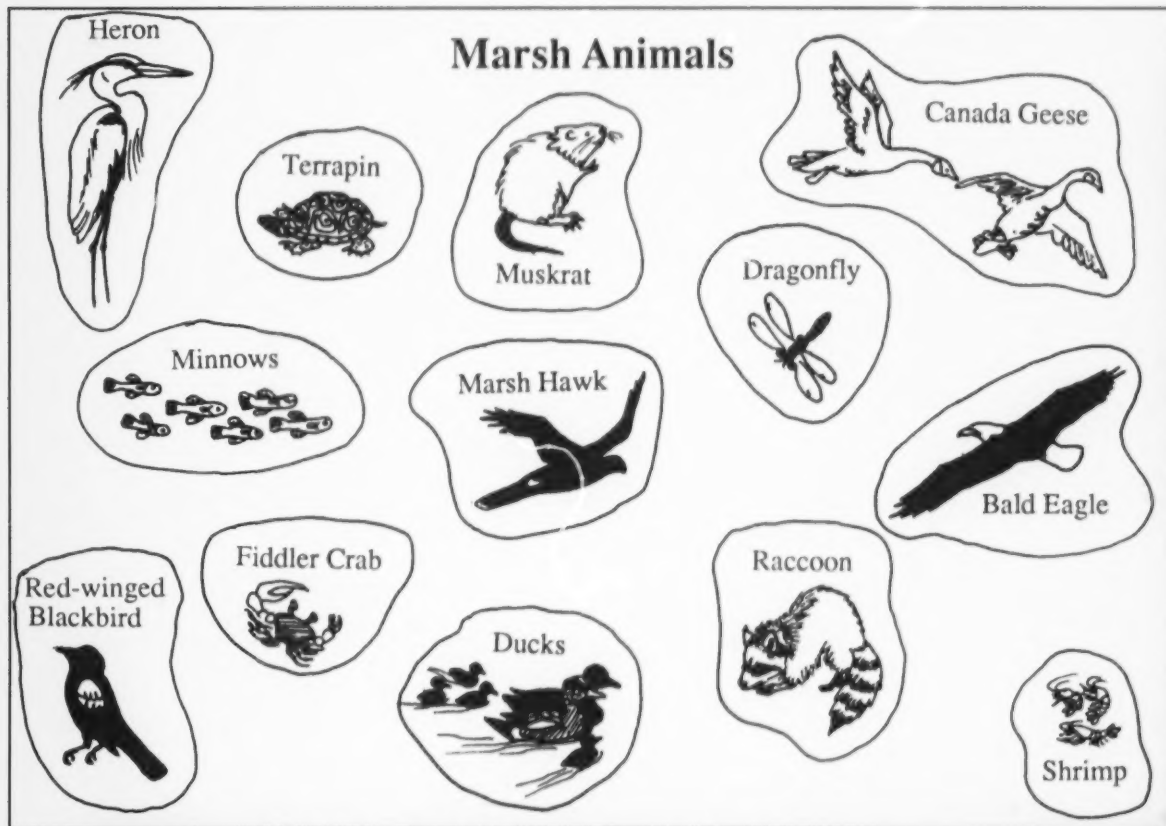
2) Single out one or two of the above habitats for further discussion.

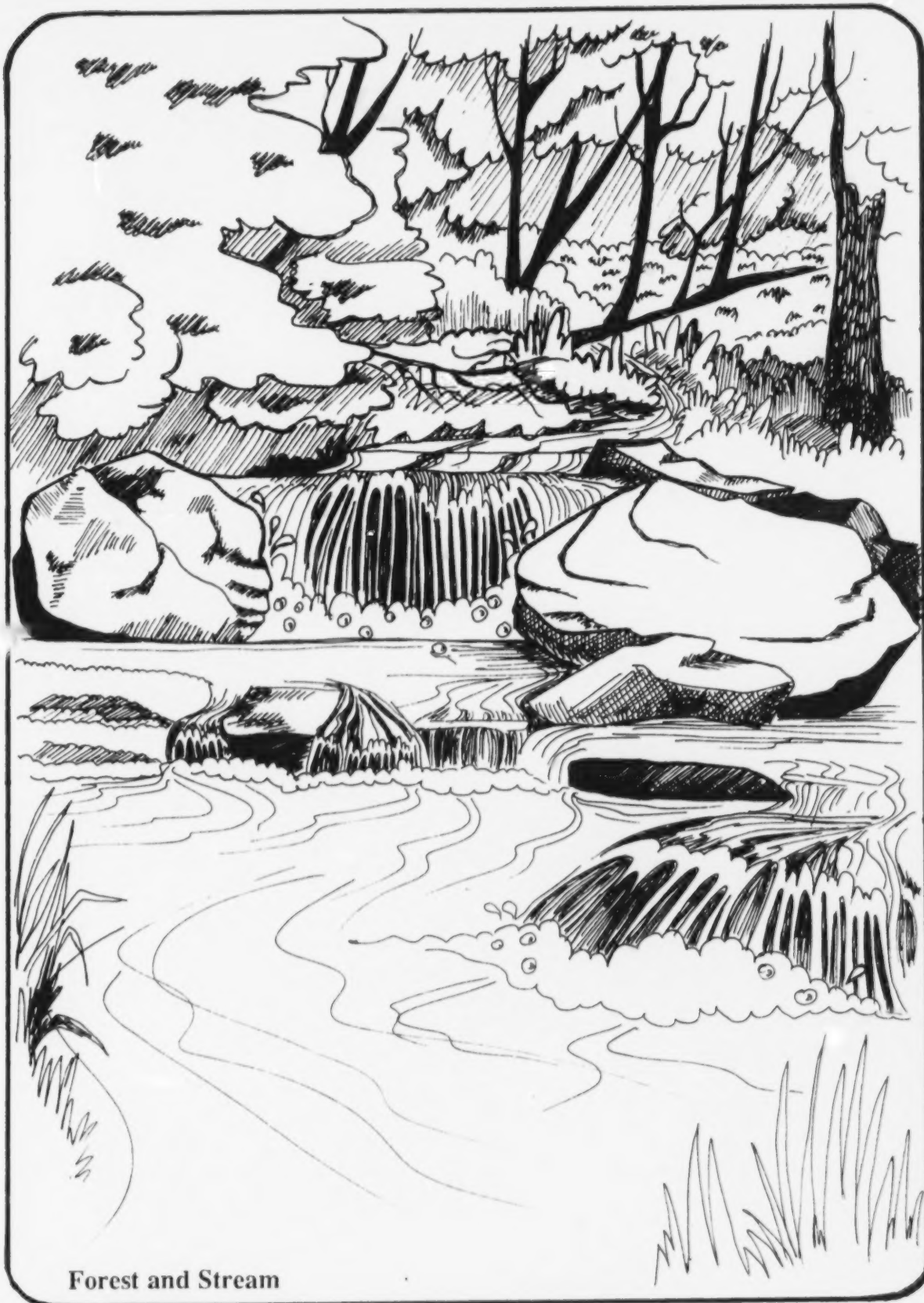
- * What does the habitat look like?
- * What kinds of plants might you see there?
- * What kinds of animals would live or visit there?
- * What kinds of things do these animals need to survive (food, water, shelter or home, space, etc.)? Describe how/where the animals can get these things in this habitat.
- * What benefit would people derive from these types of places?
- ** (Advanced) How is each habitat important for the Bay itself (see background section)?

3) What is your habitat? Draw the habitat where you get your own food, water, shelter, and space. How is this habitat different from those of the animals?

4) Hand out copies of pages 21-23. After the children color the pages, have them cut out the animal pictures and glue them to their respective habitat scenes. Where do the fish go? Where should the birds be placed? Students can use the photos or library books to find out how the plants and animals should be colored (remember, an animal's color is important for protection!).







Forest and Stream



Marsh

Tools of the Trade



Students use animal drawings or photos, or live animals, if possible, to investigate various adaptations for survival.

Grades 1-3

Objectives

- identify body parts of various animals
- recognize specially adapted body parts
- match adaptation to its function
- (advanced) in some instances, infer an animal's habitat, based on its adaptations.

Materials

- copies of drawings and questions provided
- pencils.

Subjects

Science.

Skills

Discussion, evaluation, identification, inference, invention, matching, observation, relating form to function.



Background

Adaptations, for the purpose of this lesson, can be described as specialized tools that enable an animal to survive in its habitat or environment. These tools are part of the animal's body, not something that it can choose to use the way a human would use a hammer or an axe. These tools help the animal to find or catch and eat food; move about in search of food or a mate, or to escape danger; see; breathe in air or water; or protect itself. [Note: adaptations develop gradually over long periods of time and through many generations of the species — individuals with the strongest or more successful traits are usually the survivors who live on to reproduce further generations.]

Eyes enable an animal to see, but they are not really an adaptation. Eyes on stalks, for instance, help a crab to see all around itself because it does not have a head and neck which it can turn. Stalked eyes would be an adaptation.

Distinguish for the class between more passive protection and active defense — most animals are more likely to flee or hide than to engage in battle. Examples of protective "devices" might be camouflage coloring, a hard outer shell, ability to flee quickly, outer spikes or spines that would not be palatable to a gobbling predator.

In this exercise, students will inspect drawings of animals, and answer questions about them. This may be done as a class, or individually, with some preparation.

Note: If you have a classroom aquarium, or would like to start one, its animals can be observed as examples during discussion.

Procedure

1) Begin with a class discussion of what animals need to survive — food, water, shelter, space, etc.

- * Do these resources differ for different animals?
- * Do they differ for animals that may occupy different habitats (kinds of places)?
- * Would a rabbit survive if it had to stay under water? Why not? — its body is not equipped for living under water. Would a fish be able to live in a tree? Why not?

2) Once the class catches on to this line of questioning, introduce the idea of adaptations, or "special tools." Have the students analyze their own adaptations. **A few fun activities:**

- Ask someone to try walking on four limbs instead of just two feet. How would this limit their ability to do everyday human activities?
- Working with partners, have students tape or tie (not too tight!) their thumbs to the palms of their hands. Without the use of the thumbs, try picking things up, writing, or tying shoes.

3) Hand out copies of the worksheet on page 26. If worksheets are done individually, leave enough time at the end of the lesson to discuss the answers to these questions. During discussion, have the children explain what makes particular "tools" special. Review the idea that these "tools" are "made to order" according to the animal's environment or habitat.

4) As a follow-up, distribute copies of the drawing below and review its instructions:

This animal is not well adapted to living under water. Make changes to its body so that it can live better in the Bay. Remember, it has to eat, see, breathe, move about, and protect itself in order to survive!





OSPREY

1) Find the osprey's mouth (bill). Circle the words that describe it:

sharp dull curved
straight large small

2) Study the osprey's feet. Circle the phrase that describes how this bird uses its feet:

to perch (sit) in trees or on posts;
to swim in the Bay; to catch food.

3) The osprey lives near the water. Look at the bill and feet again, and decide what it would eat.

little seeds twigs grass fish

4) Does this animal have any other special tools?

5) To protect itself, this bird would ___ away.



DUCK

1) Look at the duck's bill. Is it the same as the osprey's bill? Circle the words that describe it:

sharp dull curved
straight large small

2) This bird's feet are for s _ _ m m _ _ . We know this because its feet are webbed.

3) When this duck wants something to eat, it can dive under the water. What might it eat under there? **rocks shells Bay grasses**

4) If a larger animal was chasing this duck, how could it protect itself? The duck could:

fly away fight dive underwater
swim away call (quack) for help



BLUE CRAB

1) Can you find the crab's mouth? Circle it on the picture. What other part would help the crab to eat? It's c _ _ _ s could tear food apart.

2) The crab has two claws. How many legs does it have? ____ Can you circle the two legs that are different from the rest? These two legs are used for swimming. The pointy ones are used for w _ l _ _ n g.

3) Can you find the crab's eyes? What is special about these eyes? _____

4) The crab's protection is its hard _ h _ _ l.

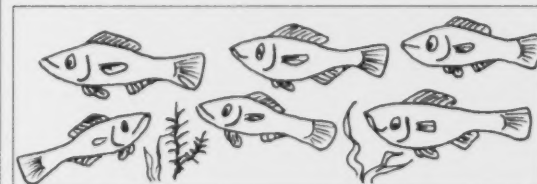
FISH

1) Fish don't have any legs. What do they use to move around? They swim with _____ .

2) Fish that swim fast and have big mouths can catch and swallow other fish. The fish drawn in the square is a small fish that swims slowly. It has to eat bits of things that fall to the bottom. Draw the kind of mouth that would help this fish to pick up tiny bits of food.



3) People breathe by using their lungs to take **oxygen** out of the air. Fish need oxygen, too, but they have to get it out of the water. Fish do not have lungs. They breathe with g _ _ _ s. Circle this part of one of the fish below.



A Watery Adventure



Students read or listen to a story about the Bay, then finish the story themselves.

Grades K-3, as appropriate

[Note: This can be an individual activity or one for the whole class. If the story is read aloud, students can each contribute a sentence or two to the ending, while the teacher writes the composition on a large piece of paper.]

Subjects

Language, social studies.

Skills

Invention, imagination, listening, reading, visualization, writing.



Danny was lying on the shore, gazing at the cottony clouds above him. He'd been able to make out four shapes in the sky already -- a whale, a horse, a giant, and an elephant. Now he could see a duck forming in the cloud directly over his head. All he needed was another good breeze to finish putting the head in place. There! It was a duck, sure enough. He let his eyes wander to the water in front of him. He hadn't realized it, but the tide was coming in and his feet were beginning to get wet. He sat up to move out of the way of the water, but quickly changed his mind and ran right in until he was knee deep in the cool lapping waves. Danny wished the waves here were big ones, like those in the ocean, but then his mother would never let him go swimming alone. He decided he'd settle for the calmer Bay water, as long as he didn't have to bring along his nagging big sister. She was always so bossy when Mother left her in charge! One day I'll show her, he thought, when I'm a big, tough pirate!

Danny always liked to think he'd become a pirate when he grew up. He often imagined himself, armed with a shiny sword, a patch over one eye, and two teeth missing (from battling other pirates), giving orders on a huge ship with twenty billowing white sails. He'd been dreaming about this ever since his teacher told the class about the pirates that used to sail in the Chesapeake Bay, many, many years ago. Now, he began daydreaming about another adventure on his ship...

It was a dark and stormy day on the water for Pirate Dan and his men. The water was rough and churning all about the ship as it forged on, heading after the enemy who'd stolen twelve barrels of tobacco from Dan's ship the day before. Dan shouted out orders, trying to be heard above the roar of the splashing waves and the booming of the enemy cannons. He called for his trusted ship's mate, One-armed Lizzie (Lizzie was his real-life best friend, who loved to play pirates, too. She wasn't really missing an arm, but she always bragged that she could lick any pirate with one arm tied behind her back).

"Hey One-arm," shouted Dan, "bring the cannons 'round for firing! We're closing in on them!"

"Cannons are ready, Cap'n Dan! We've already been knocking men down off of the stern! They snuck up on us from behind with a rowboat full of crew! But we're beating those rats!"

"Good work, Liz! A few direct hits with our cannonballs, and we'll sink 'em for sure!" The two saluted each other, and Lizzie charged off roaring like a lion.

"Lizzie! Watch out!" cried Dan. A dirty-looking toothless pirate was creeping up behind her. Dan was too late to help her! He reached the rail just in time to see his friend get pushed overboard by the scoundrel! Without a second thought, Danny jumped overboard too, and dove in the frothy water below. He had to save his best friend! "Lizzie, where are you? Can you hear me?"

"I'm over here, Danny! I'm alright. That rotten creep! I didn't even see him coming. Now what'll we do? The ship's sailing away without us!"

The booming and cries coming from the two ships were beginning to die out as the vessels drifted farther away, leaving Dan and Liz floundering behind. They were right in the center of the Bay, with eleven miles between them and either shore. They couldn't swim that far, and there wouldn't be another ship coming by for days, maybe even weeks! "Over there!" cried Dan, pointing behind his friend. "They've left that rowboat behind! Swim for it!"

So the two pirate friends climbed into the abandoned rowboat, and collapsed from exhaustion. They had no oars, so they'd have to drift with the current. There were a few useful things scattered on the floor of the boat -- a pocket knife, some twine, an empty burlap sack, and some matches....

oooooooo

Now you finish the story! What happened to Dan and Liz on this imaginary adventure? How did they survive out there on the Bay? What did they eat? What kinds of things did they see as they drifted along? Were they ever rescued? You decide what happens next!

Here are some choices to help you decide how your story should end:

1) As Liz and Dan were drifting along, they saw many kinds of animals. Which animals did they see? (Remember, this is the Chesapeake Bay!) And what were each of these animals doing?

- | | |
|----------------|------------------|
| a) fish | e) polar bear |
| b) ducks | f) cow nosed ray |
| c) (sea) gulls | g) whale |
| d) jellyfish | h) spider |

2) What were they able to find to eat out there?

- a) They didn't find anything to eat, and lost a lot of weight!
- b) They fashioned a fake worm out of a thread from the burlap sack, used the twine as a fishing line, and caught fish. They ate the fish raw.
- c) They scooped up some Bay grasses that were floating by, and ate them. They let some of the plants dry in the sun to save for later.
- d) They ate the burlap sack (but it was tough).

3) It was hot out on the Bay with no shade to protect them. Dan and Liz were very thirsty. Did they find anything to drink? (Remember, they can't drink salt water!)

- a) They took off their shoes and caught dew and rainwater in them.
- b) They found a bottle of fresh water floating by, and drank that, a little at a time.
- c) They hid from the sun under the burlap sack, so they didn't really get all that thirsty.

4) In your story, were the two pretend pirates ever rescued?

- a) Yes, their shipmates came back for them the next day.
- b) No, and legend has it that their ghosts still haunt the Bay.
- c) Yes. They saw a ship in the distance, and lit the burlap sack on fire with their matches. The ship saw their signal and came to their rescue.

BAYFOOD



Students learn about the food sources available in and around the Bay, and how some of these have been used through history. Grades 1-3, as appropriate.

Objective

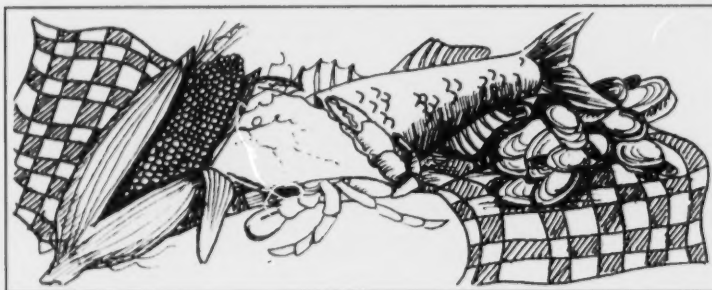
- identify food sources, both natural and cultivated
- recognize that food does not originate in a grocery store
- read a recipe and measure ingredients.

Subjects

Social studies, language, mathematics.

Skills

Discussion, following a recipe, invention, listing, measuring, reading, research (library skills).



Procedure

1) Discuss with the class where their food comes from. Most will say that it comes from a store or that a parent makes it.

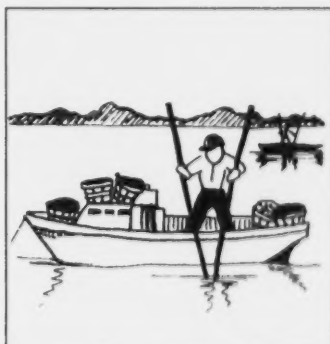
- * Can you think of any other ways that people get their food? — make a list.
- * Have you or a friend or relative ever caught something that you later ate? (fish, crabs...)

Have them imagine that they are colonists and are coming to the shores of the Chesapeake Bay for the first time.

- * What kinds of things would they be able to find to eat?
- * How would they know what things were safe to eat? If they saw a crab for the first time, would they know how to eat it, or even if it was edible? You might want to suggest that perhaps the first settlers got the idea to eat certain things from watching animals eat.

2) In this lesson the children will be using the library (or maybe a prepared classroom "library") to read about (Bay) plants and animals that are used for food, and a little about the history of these foods. These materials may be difficult to come by, so a substitute might be the story of the first Thanksgiving, or any material about hunting, fishing, farming.

3) After they have done their "research," have the class collaborate on writing a "Bayfoods" menu. The dishes on the menu can be made-up, such as duck feet fritters or French fried muskrat tails, as well as more traditional, such as roast Canada goose or rabbit stew. Try to include items representative of all animal categories — fish, bird, mammal, reptile, amphibian, and invertebrate (insects, shellfish, etc.). And don't forget the vegetables — wild or farm-raised!



4) As a finale, choose one of the real items from the menu, or any other recipe, for the class to make together. If this is not possible, maybe parents could help out with a pot-luck lunch for the class. Suggest that the children help at home in the preparation of these foods. To cut the cost of making these dishes, try making mini-portions, such as bite-sized crab cakes or hush puppies. This will give students an experience in tasting some different foods of the region. **Below are some recipes to try.**

Suggested Foods for Research:

"Wild" Foods

- Birds ducks, geese, quail, pheasant, wild turkey
 Mammals.....deer, muskrat, beaver, opossum, raccoon
 Reptiles diamondback terrapin, snapping turtle, snakes
 Amphibians.....frogs
 Fish striped bass (rockfish), drum, perch, bluefish, sea trout, rays, or any other kind of fresh- or saltwater fish
 Invertebrates Aquatic: crabs (blue), crayfish, oysters, clams, mussels, shrimp (shore or grass shrimp); Insects: (??) grasshoppers, locusts
- Plants..... wild rice, cattails, blackberries, raspberries, blueberries, fiddleheads (young ferns), Jerusalem artichokes, "sea pickles" (glasswort), pickerel weed —
 There are many, many wild plants used for food. See Roger Tory Peterson's field guide to wild edible plants, or another similar guide.

Agricultural Foods

- Animals.....chickens, pigs, sheep, other domestic animals
 Crops corn, soybeans, cantaloupe, and peaches are some of the more commonly grown Bay region cash crops. Though it is not a food item, tobacco should not be forgotten, as its production has historically been a major part of Bay region economy.

Seafood Stew

- | | |
|--|--|
| 1/4 cup (c.) margarine or butter | 1) Lightly steam, boil, or saute seafood; set aside. |
| 1 quart (qt.) milk | 2) Melt butter in a 1-1/2 qt. or larger pot. |
| 1 tablespoon (T.) Worcestershire sauce | 3) Add remaining ingredients and simmer until thoroughly mixed and heated; do not boil. Serve hot. |
| 1 teaspoon (tsp.) celery salt | |
| 3/4 tsp. salt | |
| 1/8 tsp. pepper | |
| 1/4 tsp. paprika | |
| 1/2 to 1 pound (lb.) of seafood of your choice: any fish, oysters, soft-shell clams, chopped hard-shell clams, or mussels. | Makes 6-7 cups of soup (stew). |

Bucket of Bivalves

Bring in a bucket of steamed bivalves (soft-shell clams or mussels are inexpensive), enough for each student to try one or two. Bivalves can be eaten cold and dipped in a little melted butter -- yum! Let the children pull open the shells themselves, to see how the animal is attached inside. Be sure they remove the skin from the siphon ("neck") of the clam and the threads from the mussel -- these are a bit unpleasant to chew.

Squid Italiano

- | | |
|---|--|
| 1 large jar prepared spaghetti sauce | [If desired, pasta and squid can be prepared at home; in class, students can measure the quantity of each ingredient, then mix and eat!] |
| 1 lb. pasta shells or elbows | |
| 6 squid, cleaned and cut into strips or squares | |
- Boil squid for about 6 minutes or until tender; drain. Prepare pasta according to package directions. Mix or toss pasta, sauce, and squid. Serve hot or cold.

(Hot) Crabmeat Triangles

- | | |
|--------------------------------|--|
| 1/2 lb. crabmeat | 1) Mix together first 7 ingredients. |
| 6 T. mayonnaise | 2) Cut each slice of bread into four triangles. Spread mixture on bread, sprinkle with paprika. (Opt.) bake or broil until bubbly. |
| 1/2 tsp. salt | |
| 1/2 tsp. Accent (opt.) | |
| 1 T. minced onion | |
| 1 tsp. lemon juice | |
| 1/2 c. Parmesan cheese, grated | |
| 9-10 slices white bread | |
| paprika | |

JUG-GLE YOUR WATER SUPPLY



Students are introduced to the value of water as a limited resource.

Grades K-3

Objectives

- recognize water as an essential to daily living
- become aware of our own water use habits
- (hopefully) recognize that we actually need less water than we use (and, as a result, change our daily practices accordingly).

Materials

- measuring cup (each student can bring in:)
- drinking cup
- clean gallon container (plastic milk jug, etc.)

Subjects

Science, social studies.

Skills

Anticipating needs, conserving resources, measuring.

Procedure

Here's an activity to be done in class, but some may want to try it at home, too:

1) Begin with a discussion of how our tap water is related to natural water sources.

- * Where does the water in your home or school come from?
- * How does it get to your house or school?
- * In what ways do you and your family use water at home?
- * Where does it go when it leaves the sink or toilet?

Accept guesses, but lead to the idea that water comes from lakes, streams, Bay, and is eventually returned there for reuse. Explain that water leaving the home is called wastewater and must be cleaned before it can be reused. If treatment plants become overloaded, they cannot properly clean the water before it is sent back to natural waterbodies.



- * What would happen if we ran out of clean fresh water? Point out that fish and many kinds of wildlife also live in and use the same water — another reason to keep it clean.
- * Can we make more water?
- * How can we make sure that we don't run out? (conserve what we have, etc.)

2) Have students measure out and reserve in a clean container one gallon of tap water, or a half gallon, if more appropriate. This is their water supply for one day. They must use this for drinking, brushing teeth, washing hands and face, etc. *You may want to plan this lesson with some messy activity, to be sure that students will need to wash their hands.* They may, of course, use the toilet, but remind them that each flush uses **five** times as much water as their supply for the day.

The container should not be refilled — encourage them to anticipate activities which require water and to conserve their supply so that it will last throughout the day. At the end of the day, discuss:

- * Did anyone run out of water early?
- * Quick math lesson: if anyone has any water left, have them measure the amount. [Help them] subtract from one gallon to find out how much was used.
- * What did they learn about their own water use habits?
- * Will this change the way in which they use water in the future?
- * What were some "tricks" that they learned for conserving water?
- * Make a list of things that can be done daily in school and at home to conserve water (see suggestions in background material).



DOWN THE DRAIN



Students play an add-on game which illustrates a form of water pollution. Grades 2-3

Objectives

- recognize a form of water pollution — the addition of toxic substances through our sewer systems
- become aware that our every day actions are sometimes harmful to the environment
- recognize that individual helpful actions (particularly their own) can add up to a cleaner Bay.

Materials

- clean, empty, if possible, sealed (with tape, etc.) containers from household goods (toothpaste, bar soap, shampoo, roll of toilet tissue, various detergents and cleansers, such as window cleaner, floor wax, etc., cooking oil, coffee grounds, motor oil, paint — anything that might end up being disposed of down a drain) — one for each student
- large box or other container that can represent a sink.

Subjects

Science, social studies.

Skills

Discussion, identification, kinesthetic concept development, listening, problem solving, "public" speaking.

Procedure

1) Review some of the reasons for helping to keep water clean from within our homes: water from the sink must be cleaned at a wastewater treatment plant and must eventually reach a natural waterbody again (see "Jug•gle"); our water will later be home to fish and many kinds of wildlife; it may also become drinking water for other people in the future.

2) Ask: * Do you ever add anything, such as toothpaste, to the water before it leaves the sink?

Make a list of substances on the board. Explain that the class will be playing a game that may give them an idea of how many things people add to wastewater every day.

The Drain Game

1) Pass out a container to each student, and have each decide what he/she will say about the item (see examples, below).

2) Students will make a circle. The teacher will be the "sink" and will move around the inside of the circle, with the box, collecting the items from each student.

3) Proceed as follows: The first student will hold up his item, e.g. a tube of toothpaste, and will announce to the class, "I brushed my teeth and added toothpaste to the water." Then he will place the item in the "sink." The next student will hold up his item and say, "I washed my face and added soap," and the first student will add, "and toothpaste to the water." Then the soap is placed in the "sink." Continue on thus, until reaching the last person, when a chain will have been formed, such as, "I mopped the floor and added floor wax," "and laundry detergent," "and window cleaner," "and" "and soap," "and toothpaste to the water." By the end of the line the sink should be full of containers, illustrating the amount of items that could be added from one home.



4) While still standing in the circle, have the class categorize items:

- * Which items might be most harmful to water, plants, or animals? Which would be least harmful?

Reading the labels on the containers will help in rating some of the substances. See the chart below for additional help.

Dish, laundry, and bar soaps, toothpaste, etc.	These have been made so that they harm the environment/water as little as possible (no phosphates).	These can go down the drain.
Food items	Most foods, especially oil, fats, and coffee grounds, will clog pipes, and may not be removed from wastewater.	Seal in garbage bag, or put in compost pile.
Motor oil, turpentine	These can be recycled. Keep in tightly closed container, have adults take to a recycler (check with your county).	Poisonous! Never dump down drain!!
Medicines, household cleaners, pesticides, other chemicals	Throw away leftovers or empty containers this way: Tightly cap <u>original</u> container. Wrap in many layers of newspaper. Put in tightly tied trash bag for regular collection.	Poisonous! Never dump down drain!!

- Remind the class that things dumped on the ground or in a stormdrain will be washed into waterways when it rains.
- Overall, be careful about disposing of certain substances. Keep poisons and potential pollutants out of the drain.

As a conclusion, you may want to move the "sink" back around the circle and have each student remove one item, until the sink is empty again.

Follow-up

Now that your students are more aware of what goes "down the drain," ask them to become involved citizens and to educate others about the dangers of improper disposal. Have them design posters for the school or classroom or to display at home. An example would be: "Think before you dump!" with a drawing of a sink.



Disposal Detectives



Students become aware of waste problems through observing actual disposal methods at home (Best if done in conjunction with "Down the Drain"). Grades 2-3

Objectives

- learn to become more observant of daily practices
- find a(nother) way to contribute to Bay cleanup from the home.

Subject

Social studies.

Skills

Categorizing, observation, problem solving.

Procedure

1) Have students observe at home how things are disposed of. Ask them to make a list of items that are put into the trashcan (kitchen and garage are prime areas for monitoring). Warn students not to go through a trashcan without adult supervision, in case of toxic or sharp materials.

* Are any products or substances disposed of in the sink or in the toilet?

* Do they notice any other ways that family members or neighbors dispose of items?

Have students make a list and report back to the class after a given observation period (a weekend might be a good time). In class, categorize harmful or conservative habits.

2) After discussion, encourage students to suggest to their families alternatives to harmful practices (see chart from "Drain" activity). Students should help their families to implement new, more conservative, disposal methods.

3) Discuss recycling as a way to save energy and raw materials and to cut down on amounts of trash and litter. * How does recycling help the Bay?

4) Start a paper and/or aluminum recycling drive in your classroom. Provide large containers for classroom collection, and ask students to bring empty cans and newspapers from home. Paper trash from school can also be saved for recycling. Set a goal (e.g., to fill the large container), and plan to take the material to a recycler when the goal has been reached. See recycling information, page 63.



THE TALE OF THE TROUBLESOME THING



Grades K-3

Objectives

- view the litter problem from a different perspective (that of the animals)
- learn some of the kinds of animals that inhabit the Bay's marshes.

Subjects

Social studies, language, "drama."

Skills

Discussion, interpretation, listening, psychomotor development, (reading).

This is not just another story about the Chesapeake Bay. This one is noisy. A noise story is part story and part play. The teacher or an older student reads the story while the children make the character's sounds and the sound effects on cue. It's a fun way for young students to participate in a story without having to read or memorize long lines. The story has been divided into two parts, so that it may be done in one or two periods.

Have the whole group make every noise. It works best if you practice, first. The cue to make a noise is when a noise word appears in parentheses in the story, or when the children hear the reader pause. It helps to have the reader make the motions and noises, too, especially when incidental noises appear in the story.

Before you begin the story, practice acting out each character a few times.

THE CHARACTERS (and their noises):

Silly Goose (*hold your nose and say honk! honk!*)

Grabby Crabby (*make crab claws with your hands and say clackity clack!*)

Wiggly Eel (*wiggle your body and make a wet slurpy noise - eels are slimy and slippery*)

Floppity Fishes (*flop hands front and back on your lap and say flip! flop!*)

The Heron With the Long Legs (*flap your "wings" and squawk loudly - just one, loud squawk*)

The Bald Headed Duck (*put a hand on top of your head and say quack! quack!*)

The Eagle, Silent and Majestic (*"soar" with your arms outstretched - don't make any sound at all*)

Musky Muskrat, Who Gnaws On Things (*make lots of chewing or gnawing noises*)

Clapping Clam, Who Can't Come Out of His Shell (*hold the heels of your hands together and clap like a clam*)

Terrapin, the Turtle With the Funny Name (*curl up as though you're hiding in your shell*)



THE STORY: THE TALE OF THE TROUBLESOME THING

(PART I)

Down by the edge of the Bay, where the water comes lap lap lapping into shore (*lap!lap!lap!*), is a place where tall, tall grasses grow higher than the sky. And in this place, where the ground is sometimes under water and sometimes just really mushy, and it smells kind of smelly, you can find lots of wonderful critters who like to live there.

This day was a beautiful day. The sky was blue and the water was wet and the breeze was just breezy enough. The Eagle, Silent and Majestic (*"soar" silently*) glided over the marsh hunting for prey. And all of the other animals went about their usual happy business.

"There's a lot of food over here!" called Grabby Crabby (*clackity clack!*) who swam in with the tide. "Sure there is, if you like to eat dead stuff!" cried the little school of Floppity Fishes (*flip! flop!*). "We'd rather find some nice floating bits of plants to swallow. We'll see you later!" And the Floppity Fishes (*flip! flop!*) turned and scooted off with their tails swishing behind.

So Grabby Crabby (*clackity clack!*) ate his fill, and moved off through the wet water weeds to find something else to get into. "Ouch!" yelped Grabby Crabby (*clackity clack!*) as he bumped into something strange and hard (*bagang! bong!*). "Why, what's this strange and hard something?" wondered Grabby Crabby (*clackity clack!*). "This doesn't belong here in our nice clean marsh!" He climbed up on top of the Thing, then climbed down the other side of it. Then he crept his funny sideways crab creep all around the Thing. But with all this investigating, he still couldn't figure out what the Thing was.

Soon, along came Wiggly Eel (*slurp!*), who wriggled her skinny, slimy body over to the Thing. "Why, what's this?" she asked Grabby Crabby (*clackity clack!*). "I think it's a Thing," he answered. "What sort of a Thing?" questioned Wiggly Eel (*slurp!*). "It's a Thing that doesn't belong here!" Grabby said.

While Wiggly Eel (*slurp!*) was twirling 'round and 'round the Thing, inspecting every inch of it, Terrapin, the Turtle With the Funny Name (*curl up*) happened by. "Well, well, my good companions. What's this unfamiliar item?" the turtle queried. Terrapin was rather intelligent, even though he seemed sort of slow. "We don't know. It's a Thing. But we don't know what kind of a Thing it is. Maybe you can figure it out," explained Grabby Crabby (*clackity clack!*).

There was silence while the turtle pondered the Thing. "I am certain," he paused, "that this Thing is quite a Troublesome Thing. Yes that's it — it's a Troublesome Thing," said Terrapin, the Turtle With the Funny Name (*curl up*).

"That doesn't help us at all!" sighed Wiggly Eel (*slurp!*). "No, not one bit!" added Grabby Crabby (*clackity clack!*). At that, the indignant Terrapin, the Turtle With the Funny Name (*curl up*), turned and lumbered off, for his feelings were truly hurt.

"Let's go find Musky!" suggested Grabby, "He's been all over this marsh, maybe he'll know what this Troublesome Thing is!" So the two swimmers headed off to find their experienced friend. When they came to a hole in the mucky mud bottom, Wiggly Eel (*slurp!*) put her head in the hole and called out, "Hello (*hello!*) in there! Is anyone home?"

"Yes, I'm here! No need to shout!" came the response, and out popped a furry creature with a long skinny tail. It was Musky Muskrat, Who Gnaws On Things (*chewing sounds*). Musky Muskrat was a mammal of the marsh, who built tunnels under the water and was very good at chopping down tall grasses with his big front teeth. The other water animals didn't mind that he was so hairy, because he was a good swimmer, and besides, he was awfully friendly.

"Musky, you must come and see! We've found a Troublesome Thing! It doesn't belong here, and we don't know where it came from!" began the eel. "We don't even know what it is! And it's ugly,"



Grabby complained (he was a crabby crab).

"My, my!" gasped Musky Muskrat, Who Gnaws On Things (*chewing sounds*), whistling through his buck teeth.

"We thought that since you've gnawed on so many things, you could gnaw on this Thing, and tell us what it is." Grabby was beginning to get crabby.

"You've got me all wrong, my friends! I don't gnaw on just any old Thing! No, no! I only gnaw on twigs and marsh grasses! If I gnawed on a strange Thing, I might break a tooth, and then where would I be? A muskrat without a tooth? Why that's the silliest thing I ever heard!" And with that, Musky Muskrat, Who Gnaws On Things (*chewing sounds*) dove back into his tunnel with a pop (*pop!*).

"'Silly' he says! Humph!" said the eel. "The only one around here who's silly is Silly Goose (*honk! honk!*)!"

"That's it!" the crab brightened. "It's been getting colder and winter is coming! I'll bet we can find Silly Goose (*honk! honk!*) eating grain in that field! She must be back from the North by now!" The two picked up their spirits and sped for the other edge of the marsh. When they reached some shallower water, Wiggly Eel (*slurp!*) stopped. "Wait, Grabby! I can't go up on land. I won't be able to breathe!" "You stay in the water, then, Wiggly. I can climb up onto the ground for a little while. I'll find Silly Goose (*honk! honk!*) and meet you back at the Thing."

So while the eel waited in the cool shady water, the crab climbed cautiously out onto the muddy shore. His stalked eyes waved frantically all around him, ever alerted to danger. He stopped dead in his tracks when he heard the flapping wings of The Heron With the Long Legs (*squawk!*). That big bird would surely gobble him up if he were seen! When the old bird had passed, Grabby Crabby (*clackity clack!*) continued on in search of the goose. When he found her, she was nibbling away at some leftover corn kernels.

"Hey, there, my little pinching friend! It's been a long time, has it not? How've you been? How's your end of the Bay? Was the summer awfully hot here?" Silly Goose (*honk! honk!*) often babbled until she had to be interrupted. "Silly! I'm glad to have found you! There's a strange and troublesome Thing in our water! We don't like having it there! Please come and help us!" cried the frustrated crab.

"Of course, I will help you," mumbled the goose, who's mouth was still full of grain. She swallowed with a gulp (*gulp!*). "Now what's all this about a Thing?" "I bumped into it," explained Grabby, "because it was in my way. I've never seen it before. You've flown hundreds of miles and you've seen lots of things. I thought that maybe you could tell us what this Thing is, and where it came from."

"Well, now, let's see. When you bumped into the Thing, what sort of noise did it make?" asked Silly Goose (*honk! honk!*). "Did it thump? Or did it clank?" "I think it clanked," said the crab, trying to recall. "No, wait! It was more of a bang! Or was it a bong?"

"I'll bet I know!" honked the goose, flapping excitedly. "Did it go like this: bagang! bong! (*bagang! bong!*) and did it ring for a bit?"

"Yes! You do know what kind of a Thing that is! I knew you could help!" Grabby wasn't so crabby any more.

"You won't be so excited when I tell you what it is. It's not a very nice Thing. It's a Thing that doesn't belong in our marsh, or even in the water at all! It's **TRASH!** (*gasp!!*) Something that a

human probably threw away. Those humans don't think that it bothers us or hurts our homes to throw old, unwanted things in our marsh or even in the Bay. We can't let that Thing stay! Oh, no! Not for one more minute! If we let them put one Thing into our water, they'll keep on dumping more and more Things in, until there's no more room for us!"



Comprehension questions (as a review before beginning Part II):

- * Why are the animals so upset about the Thing?
- * Do you think the marsh animals should do something about the Thing? What should they do? Do you think that anyone else should do something about the Thing? (Who?)
- * What do you think will happen in the next part of the story?

(PART II)

"Come on, then, Silly Goose (*honk! honk!*), we've got to hurry back! The Thing has been there for a while, already!" Grabby Crabby (*clackity clack!*) gave the goose's caboose a pinch as she headed for the runway, flapping as she ran so she could get up into the air. The crab, eyes tucked in tightly, held onto her tail feathers for dear life. "Fly more to your left, Silly!" yelled Grabby over the noise of her flapping (*flap! flap! flap!*). Grabby had dared to poke his eyes out of his shell just a little. "The Thing should be right over there!"

As they flew frantically back over the marsh, they passed over Musky Muskrat, Who Gnaws On Things (*chewing sounds*), who looked up from his chewing and waved. "Where are you going?" Musky shouted up to them. Silly Goose (*honk! honk!*) was too busy flapping to answer, and Grabby Crabby (*clackity clack!*) was too scared to bother. So the muskrat followed them from below, wondering if all the commotion was still about that silly Thing.

On his way, Musky Muskrat, Who Gnaws On Things (*chewing sounds*) nearly ran over Terrapin, the Turtle With the Funny Name (*curl up*). "Watch where you're going, Speedy!" grumbled the terrapin. "I'm sorry, Terrapin, but I'm hurrying to see where Silly Goose (*honk! honk!*) and Grabby Crabby (*clackity clack!*) are going. I think it's about that Thing the crab found!" explained Musky. "Oh, that Thing is a Troublesome Thing, all right! I told them it was a Troublesome Thing! I'll come with you!" And the worried terrapin climbed on Musky's back, because he knew that he could never keep up with the muskrat.

As the airborne pair came closer to the spot where the Thing had been found, Grabby directed his friend to land. "Hold on tightly, then," instructed the goose, and she bent her wings and dropped in for a landing. The two came down on the water with a tremendous splash (*splash!!*). Silly Goose (*honk! honk!*) was so excited that she hadn't looked down before hitting the water. "Hey! What do you think you're doing?" someone quacked from underneath the goose. "Why don't you watch where you're landing?" It was the Bald Headed Duck (*quack! quack!*), who was more than a bit annoyed.

"Excuse us," began Grabby, "but we were hurrying to the Thing. We want to get it out of our marsh!" Just then, Musky and Terrapin swam up to the group. "Is that Thing still troubling you?" asked Musky, panting.

"Still troubling us? Still troubling us?" babbled Silly Goose (*honk! honk!*). "Why, it should bother

you, too! This marsh is your home! Do you want it polluted with trash and other Things?"

"Of course not! I hadn't thought of that before," said Musky. "I never wanted it here," Terrapin chimed in, "it's a Troublesome Thing!"

"What are we waiting for?" asked the Bald Headed Duck (*quack! quack!*). "If it's so troublesome, let's go and get rid of it!" So Grabby Crabby (*clackity clack!*) led the way, with Silly Goose (*honk! honk!*) next in line. Musky Muskrat, Who Gnaws On Things (*chewing sounds*) came next, and then the Bald Headed Duck (*quack! quack!*), who was still a little dizzy. Floppity Fishes (*flip! flop!*) were curious and came along, and trailing behind came Terrapin, the Turtle With the Funny Name (*curl up*).

When they reached Wiggly Eel (*slurp!*), who was waiting for them, Grabby looked around, but couldn't find the Thing. "What happened to the Thing?" asked the crab. "You won't believe it," said the eel. "Come with me and you'll find out." So Wiggly squirmed off, with the others following behind her.

Soon, they came upon Clapping Clam, Who Can't Come Out of His Shell (*clap*). "Clapping Clam can tell you why the Thing isn't here," announced the eel.

"But why are you here, Clapping Clam?" asked the Bald Headed Duck (*quack! quack!*). "You belong out in the Bay, not here in the marsh."

"I'm convinced," claimed the clam, "that it was quite a close call! I was snatched from the Bay by a big old gull! He was about to gobble me up! But I'm smarter than that bird. I saw some trash down here in the water, and I know how those gulls love trash! So I said, 'Listen, you gull, why eat me? I'm only a small snack. Look down there! There's a big hunk of trash! What a clever trade it would be, to exchange little me for all that wonderful trash!' And wouldn't you know, that stupid bird fell for it! He dropped me right away and swooped down and plucked that Thing right out of the water!"

"That was awfully lucky! But where do you think that gull will go with the Thing? He'll soon find out that he can't really eat it!" said the duck. "Don't worry about that," laughed Clapping Clam, Who Can't Come Out of His Shell (*clap*), "he was headed right for the dump! He'll probably leave it there, he knows where trash belongs!"

"I wish people knew where to put their trash. Then we wouldn't have to worry about it messing up our home!" And the group, relieved, but still looking a little worried, began to split up and go about their business again. "Hey, Clam," called the goose, "I'll give you a ride back to the Bay. I've got to catch up with the other geese out in the field." Silly Goose (*honk! honk!*) picked up the little clam and flew away, waving goodbye to her other friends (*wave*)...

As they took off, they saw the Heron With the Long Legs (*squawk!*) flapping over the marsh. And off in the distance was the silhouette of the Eagle, Silent and Majestic (*"soar" silently*), still patrolling the scene.

THE END



Comprehension Questions:

- * How would you feel if someone dumped trash in your bedroom?
- * How did the animals feel about having the Thing in their home?
- * What would happen to the marsh if many more Things were put there?
- * The animals were lucky that the Thing was taken away. Do you think that this is what usually happens to trash?
- * The animals in this story stuck together when there was trouble. Discuss ways that people could stick together to keep the water clean for the animals.

Chessie Returns!



The cartoon 'Chessie' character was originally developed by Dave Folker for the U.S. Fish and Wildlife Service. Chessie's first coloring book, *Chessie: A Chesapeake Bay Story*, is available from the Service. Write to: USFWS, Chesapeake Bay Estuary Program, Suite 401, 900 Bestgate Road, Annapolis, Maryland 21401.

"I don't care," claimed the boy, as he tossed an old can
right into the Bay, with a flick of his hand.

"It really won't matter at all, anyway,
I know that the tide here will wash it away."



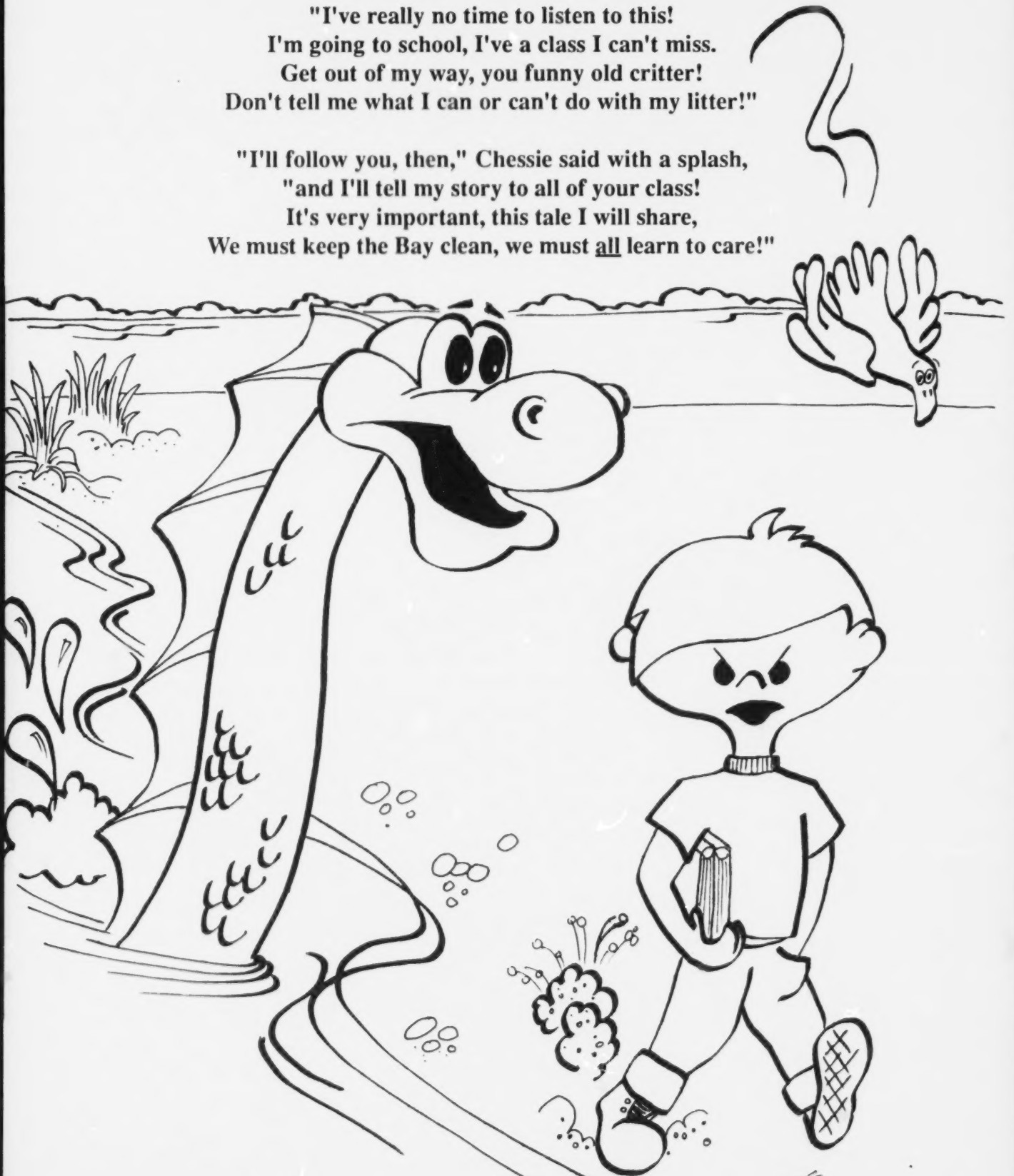
"Now hold on, just a minute! This water's my home!"
came a cry from the gurgling, watery foam.
"Who are you?" gasped the boy to the beast (who was green),
"Well, you are the strangest thing I've ever seen!"

"Why, I'm Chessie, the monster of Chesapeake Bay,
I've come here to say that it isn't okay
to litter and dirty the home of my friends!
The health of the land and the water depends
on people like you! You really should care!
How would you like to breathe dirty air?
The animals know, but the people should care
and learn more about this big place that they share!"



"I've really no time to listen to this!
I'm going to school, I've a class I can't miss.
Get out of my way, you funny old critter!
Don't tell me what I can or can't do with my litter!"

"I'll follow you, then," Chessie said with a splash,
"and I'll tell my story to all of your class!
It's very important, this tale I will share,
We must keep the Bay clean, we must all learn to care!"



"Hey, it's Chessie!" cried the children, as she came through the door.

The boy looked surprised, "Has she been here before?"

"Everyone knows Chessie," laughed a girl in a dress,

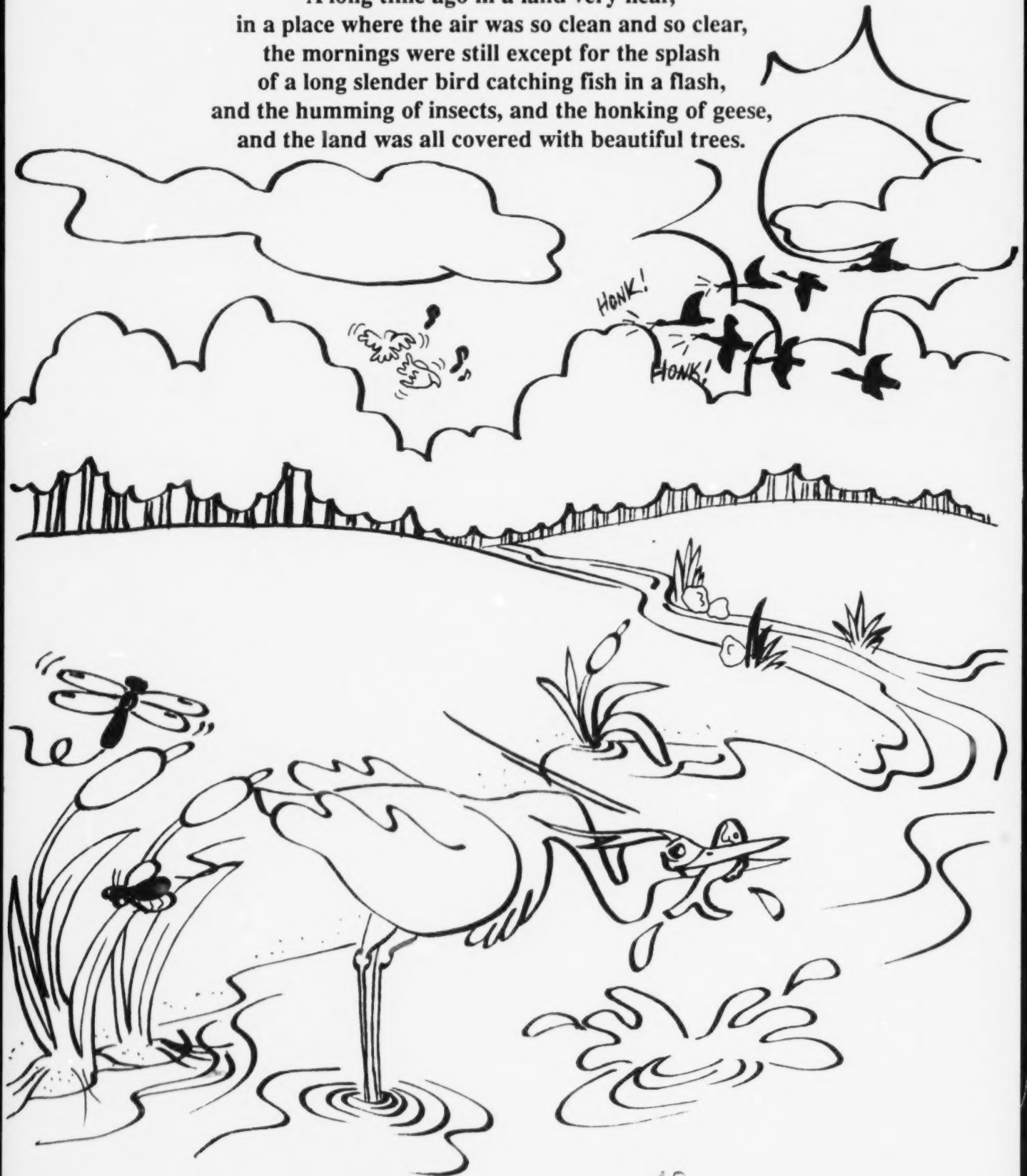
"Before Chessie came, this place was a mess!

But she taught us how special our Bay is to us.

Now sit down and listen, and don't make a fuss!"



A long time ago in a land very near,
in a place where the air was so clean and so clear,
the mornings were still except for the splash
of a long slender bird catching fish in a flash,
and the humming of insects, and the honking of geese,
and the land was all covered with beautiful trees.



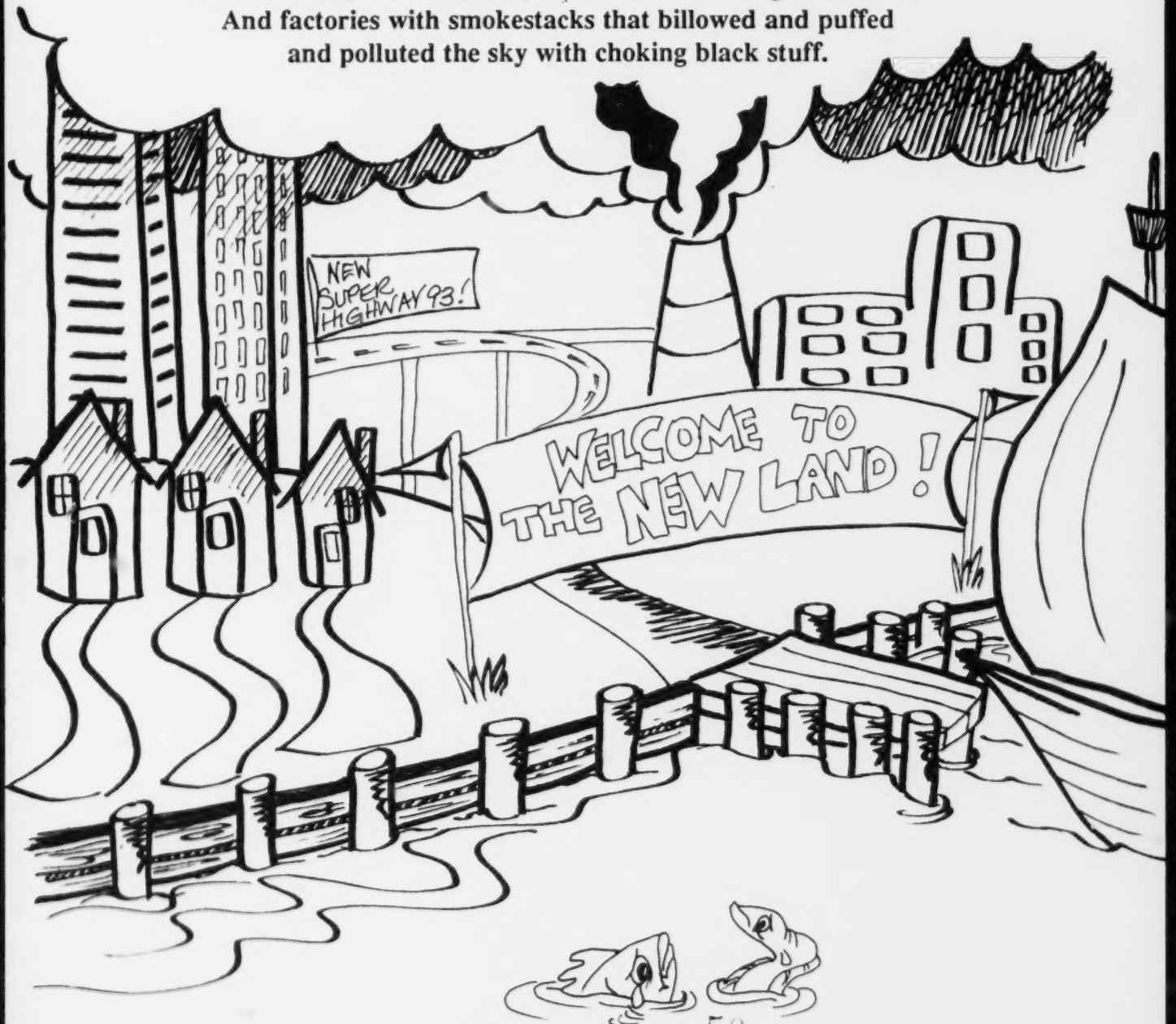
Then men came from afar, with their axes they chopped,
they planted their crops, and before they had stopped,
where there once had stood trees, now stood huge fields of hay.

They built houses galore, they decided to stay.
So they lived off the land and they fished in the Bay,
And in the beginning, life was okay.



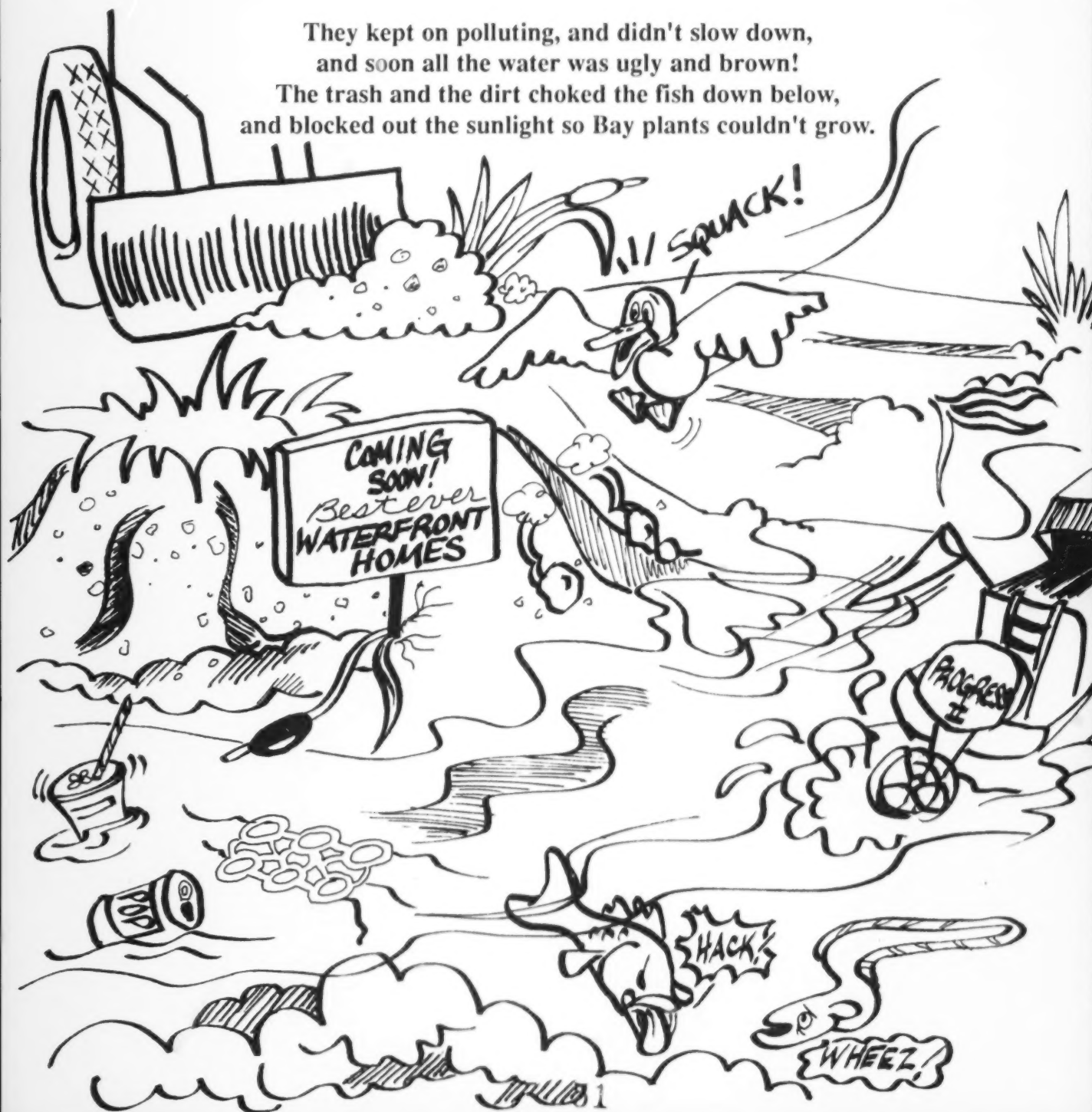
Then more people came and the colony grew,
and they needed more space -- so what did they do?
They tore down more trees and they cleared off the ground
where the animals lived, where their food had been found.
And soon where a babbling brook once had been,
came the buzzing of progress, a deafening din.

"This life's for the birds!" was the colonists' cry,
"Let's build several highways where dirt roads now lie!"
And then they built skyscrapers so high, high, high, HIGH!
And factories with smokestacks that billowed and puffed
and polluted the sky with choking black stuff.



They ripped up the marshes to build close to the shore,
they threw trash in the water, and then, what is more,
they took all the fish, and left none for the others,
their boats churned the bottom, the oysters were smothered!
They shot all the ducks and the geese and the deer!
They kept plowing down trees -- their reason was clear --
they wanted more roads and more buildings built here.

They kept on polluting, and didn't slow down,
and soon all the water was ugly and brown!
The trash and the dirt choked the fish down below,
and blocked out the sunlight so Bay plants couldn't grow.



"Stop! STOP!" cried the boy, "I can't bear to hear more!
I've learned my lesson, by hearing your lore!
I'll join you in helping to make our Bay better!
Now I know it's important to all work together!"

"I'll pick up some trash, that's one thing I'll do!
And when I go fishing, I'll take only a few!
At home I'll save water, be careful, and think!
And I'll never dump poisons out into the sink!
I've learned even small things that kids like us do
can hurt or can help! It's up to me and to you!"



"From misusing the water and the land all around,
we've been losing our wildlife that used to abound.
But we can all help problems like these to slow down!
The Bay and its animals need OUR help to survive!
Let's all take part in keeping our Chesapeake alive!"



WET WORDS

Fill in the missing letters. If you need help, see the word list below.

A m _ r _ _ is a place where tall grasses grow.

Sometimes it is dry there, but at other times there is _ _ t e _ there.

This is why it is called a w _ t _ a _ d.

This kind of place is very important to the Bay. It helps to keep s _ _ l from washing off of the land and into the water.

It is a good hiding place for small _ i s _ , t u _ _ l _ s, and even some _ _ c _ _ who raise their young there.

This is also a good place for animals to find food. A great blue _ _ r _ n is a tall bird with a long bill. This bird sits very still so it is hard to find in tall grass. You may see it w _ d _ n _ in shallow water, h _ _ t _ _ _ for fish or crabs to eat.

The _ l _ e _ _ a _ is a funny-looking animal. It has ten legs and a hard shell. It swims in the Bay, and sometimes hides in b _ _ _ r _ s _ e _ on the bottom. Many p _ _ p _ _ like to eat these after they have been _ t _ _ m _ _.

Answers / Word List

bay grasses	blue crab	ducks	fish	food
heron	hunting	marsh	people	shell
soil	wetland	steamed	turtles	wading
water				

How many of these words can you find? Some read left to right, others go up and down.



ANIMAL ODDBALLS

In each group, circle the one animal that does not belong with the others.

1



Duck



Heron



Eagle



Dragonfly

2



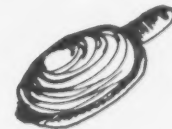
Oyster



Snail



Crab



Clam

3



Minnow



Jellyfish



Bass



Flounder

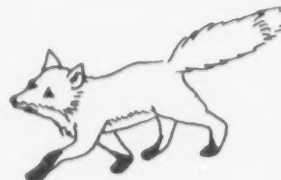
4



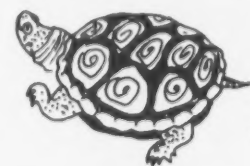
Deer



Muskrat



Fox

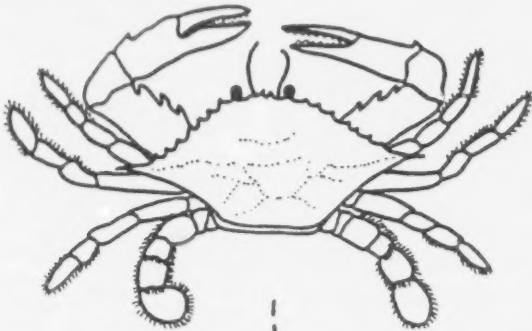


Terrapin (turtle)

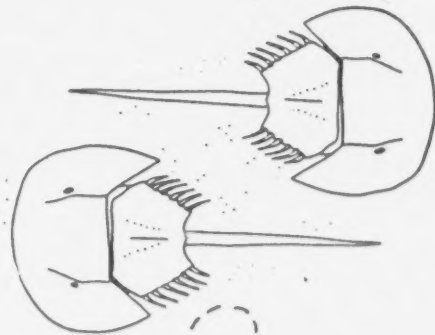
Answers: 1) The dragonfly is the only one that is not a bird; it is an insect. 2) All of these animals have shells, but the crab is the only one with [jointed or bendable] legs. 3) The jellyfish is not really a fish at all! It has none of the features of a fish -- bones, fins, scales, etc. The other three are true fish. 4) The deer, muskrat, and fox are all furry mammals. The terrapin is a reptile.

Counting Critters

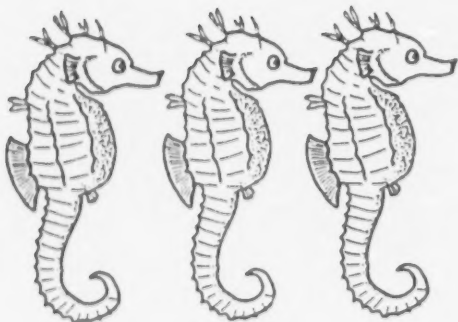
Here are some animals of the Chesapeake Bay. Can you name them? How many animals can you count in each group? Trace the numbers below the animals. Then color the pictures!



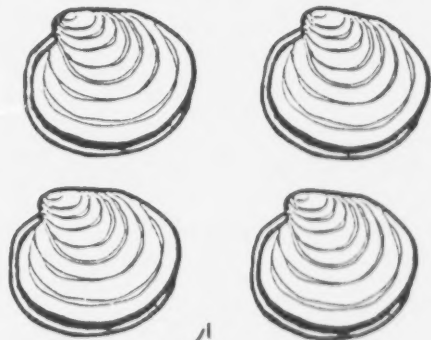
1



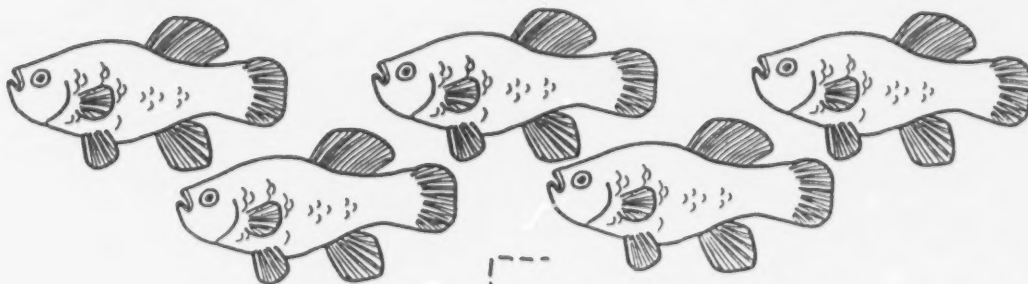
2



3



4



5

This activity was adapted from a booklet of activities developed by Britt Eckhardt Slattery for the National Aquarium in Baltimore.

CHESAPEAKE SCRAMBLE

The words below are the names of the Bay animals pictured on this page. The letters in the words are all scrambled! Can you unscramble the letters to correctly spell the names? Then, draw a line from the animal's name to its picture.



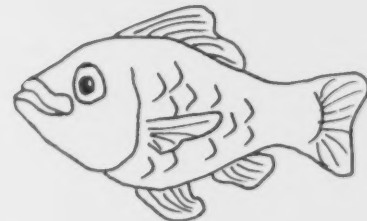
HIFS



PRMHSI

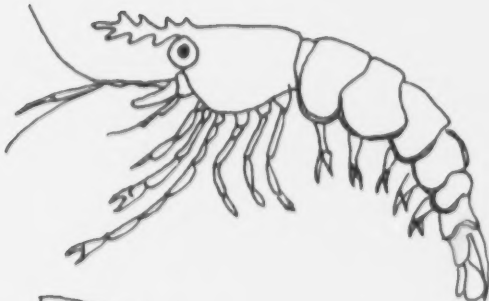
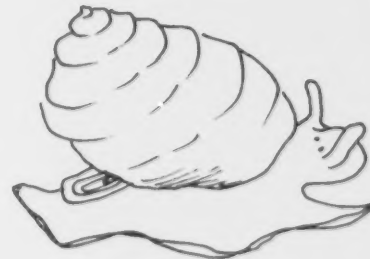


YRA



TORET

UTLERT



ANILS

MROW



LACM



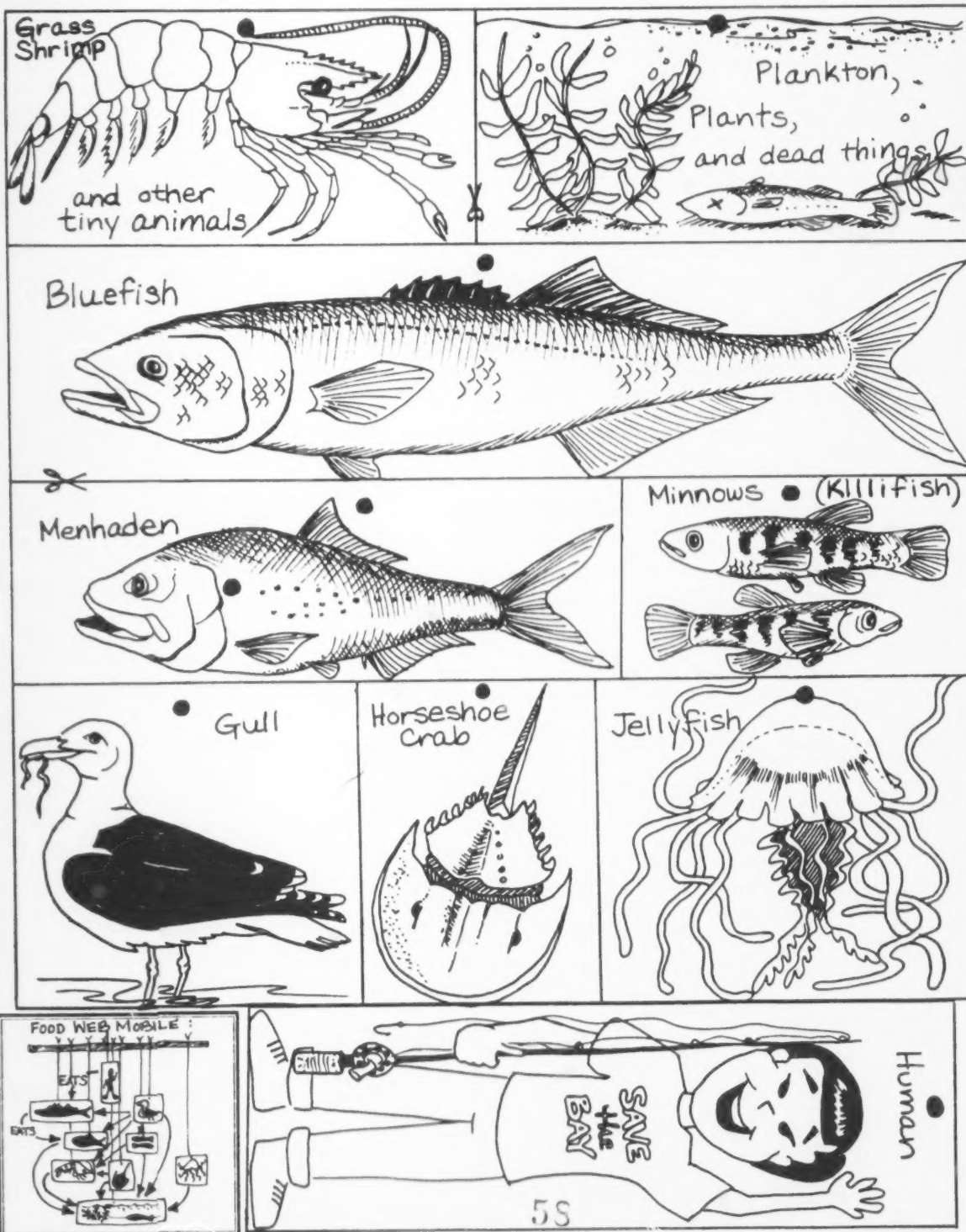
ANSWERS: FISH, SHRIMP, RAY, OTTER, TURTLE, SNAIL, WORM, CLAM

This activity was adapted from a booklet of activities developed by Britt Eckhardt Slattery for the National Aquarium in Baltimore.

Make a Food Web Mobile!

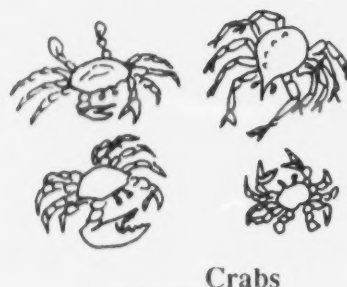
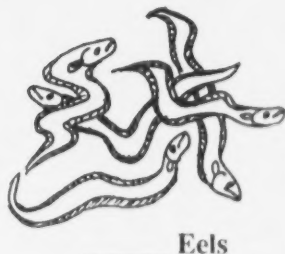
Here are pictures of animals that make up part of the Bay's food web. In a food web, plants become food for animals, animals become food for other animals, and some plants and animals add to the soil, helping more plants to grow. Following the directions and the diagram at the bottom of the page, make a food web mobile to hang in your favorite place.

You will need: scissors, crayons, string or fishing line, a stick that is about 12 inches long, and (optional) paste and colored cardboard. **Step 1)** Color and cut out the pieces. If you'd like to make the pieces more sturdy, paste them to pieces of colored cardboard. **Step 2)** Punch a hole at the top of each piece and tie on a piece of string. **Step 3)** Hang the animals from the stick. Those that eat the other animals should hang closest to the stick; the animals that get eaten by them should come next, and so on.

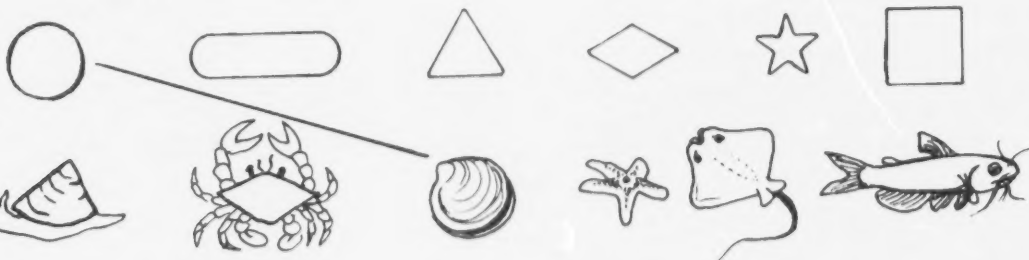


Math Time!

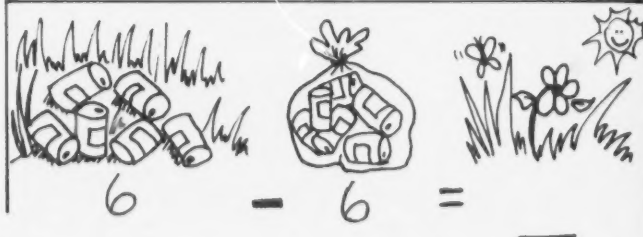
How many?



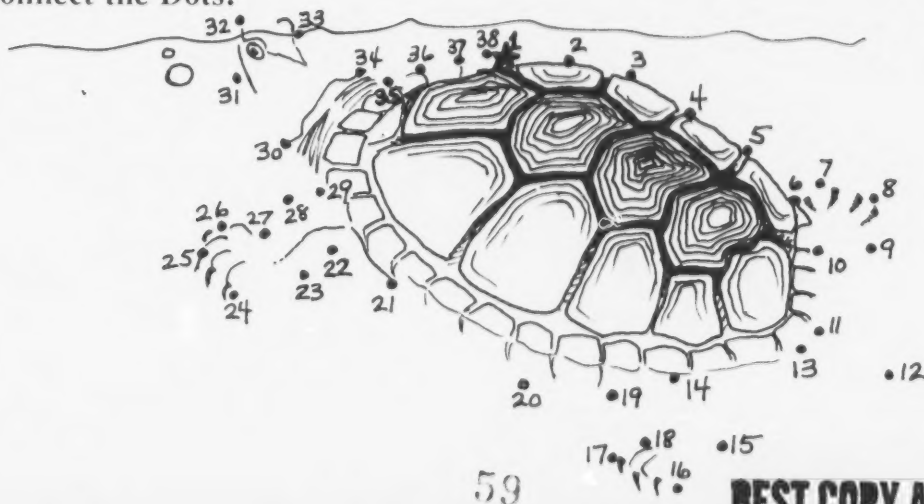
Match the shapes:



Add or Subtract:



Connect the Dots!



BAY BABIES!

On the left side of this page are pictures of adult (grown up) Bay animals. On the right side of the page are their young, but the pictures are all mixed up! Can you match the young with their parents? Then color the pictures!



Eel



Zoea



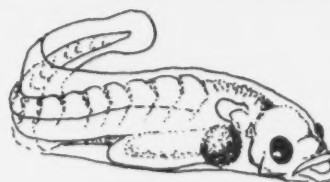
Swan



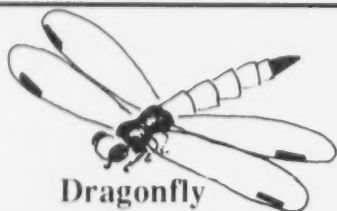
Duckling



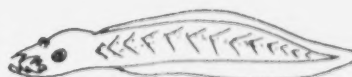
Duck



Fry



Dragonfly



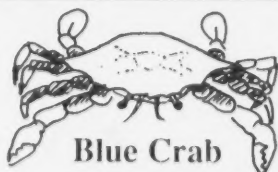
Elver



Striped Bass



Nymph



Blue Crab



Cygnet

Answers: eel / elver; swan / cygnet; duck / duckling; dragonfly / nymph; striped bass / fry; blue crab / zoea

The A-Maze-ing Striper

Many people make their money by catching fish, crabs, oysters, or clams. In the Bay region, these people are called **watermen**. They sell their catch to people who want to eat these tasty critters of the Bay. Lots of other men and women just enjoy catching fish. They are called **sports fishermen** or **anglers**.

For a long time, the *striped bass* (also called *striper* or *rockfish*) has brought fun, money, and food to anglers and watermen, and other people who live in the Bay's watershed. But many people are now worried about the survival of striped bass in the Bay. Because of overfishing (catching too many fish) and pollution, there are not as many stripers in the Bay as there used to be. In order for the striped bass to thrive again in the waters of the Bay, they need lots of help from us.

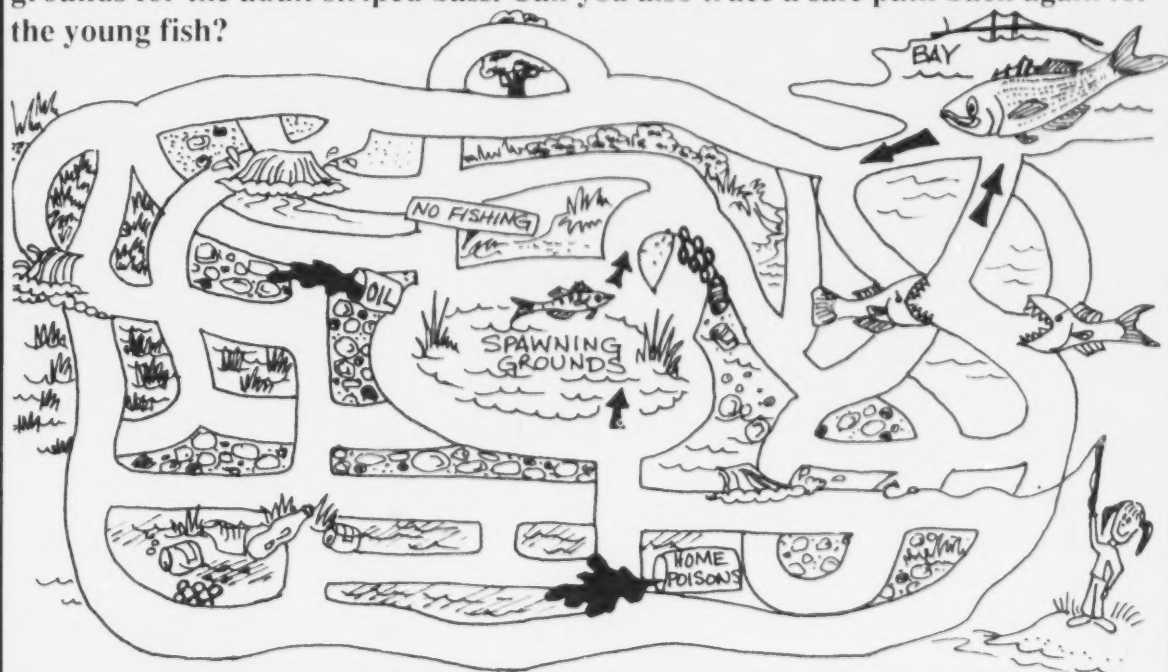
The striper is a kind of fish that lives most of the year in salty ocean water. When it is time for the fish to have young (to **spawn**), they must swim from the ocean, through the Chesapeake Bay, and up into the freshwater rivers and streams that are connected to the Bay. Here, they lay their eggs, then return to the ocean. The young fish hatch in the fresh water. When they are old enough, they, too must swim down the river, through the Bay, and out into the ocean. These fish will return to the Bay area when it is time for them to spawn.

Lots of things can happen along the way to keep adult stripers from spawning. They can be caught, or they could die because of unhealthy water. Sometimes their path upstream is blocked by something man-made, such as a dam.

Young fish may have an even harder time surviving the journey, because they are small. Naturally, many young stripers become food for other animals. But lots of others die because the water is polluted. Water does not have to be very polluted to kill tiny, young fish.

Can you think of any ways that people could help these fish to survive?

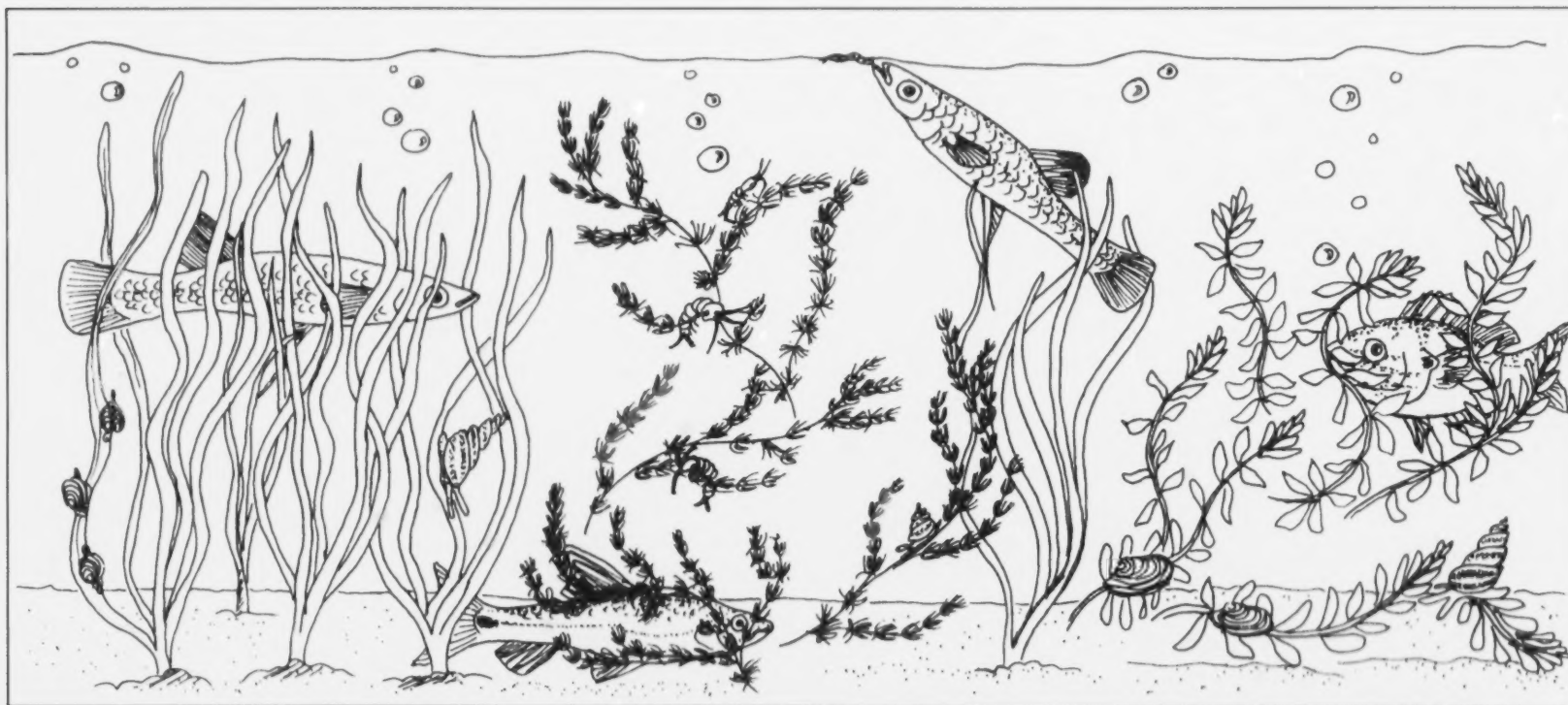
Help the striper get to his spawning grounds! Draw a path to the spawning grounds for the adult striped bass. Can you also trace a safe path back again for the young fish?



BEST COPY AVAILABLE

Animal Hide and Seek

Beds of underwater grasses (called "SAV") are important nursery, hiding and feeding areas for many different Bay animals. Pretend that you are a big, hungry fish looking for a mouthful. How many animals can you find hiding among these grasses? Circle them.



KEY:



BEST COPY AVAILABLE

This Restaurant is for the Birds!

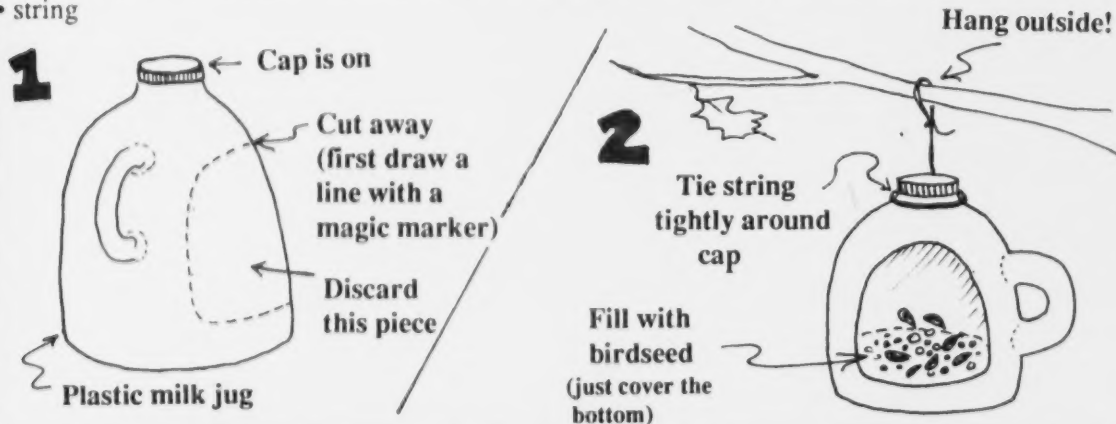
Birds are a very important part of the **ecology** of the Bay and the land in its watershed. Many people enjoy watching birds. Some even join clubs so that they can find and watch birds with a whole group of bird **enthusiasts**. Ducks and hawks are two types of birds found in the Bay region that are exciting to watch. But you don't even have to leave your house to enjoy some of the other kinds of birds found near the Bay. There are probably cardinals (red birds), blue jays, and sparrows, to name a few, in your back yard. Even if you live in the city, you can see birds: pigeons, gulls, house finches, and more! Baltimore City has its own peregrine falcon, an endangered species, who nests in the U. S. Fidelity and Guaranty building. How many sorts of birds can you see near your house?

If you would like to begin watching and learning about birds, one of the best ways is to attract them to a feeder. In the winter, the feeder will also help to feed birds that might not be finding enough to eat. Here are some simple bird feeders that you can make! Hang them near a window and let the birds have a feast!

Jug Feeder

You will need:

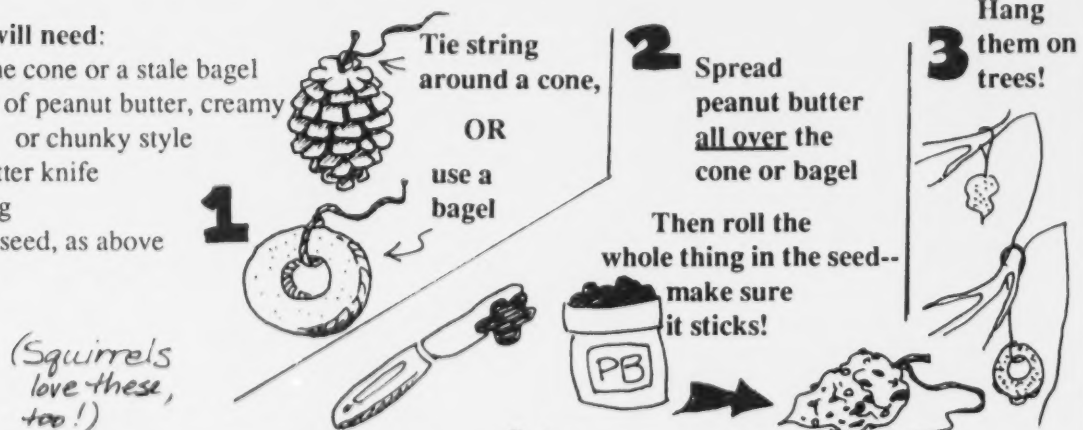
- an empty plastic milk jug, with the cap (a cardboard milk carton works, too) -- make sure it's clean
- a good pair of scissors, and an adult to help you do the cutting
- a bag of raw sunflower seeds or any wild bird seed (many grocery stores sell this)
- string



Peanut Butter Treats

You will need:

- a pine cone or a stale bagel
- a jar of peanut butter, creamy or chunky style
- a butter knife
- string
- bird seed, as above



Chesapeake Bay Organizations

Federal Agencies

Chesapeake Bay Estuary Program
U.S. Fish and Wildlife Service
Suite 401, 900 Bestgate Road
Annapolis, Maryland 21401 (301) 224-2732

Chesapeake Bay Liaison Office
Environmental Protection Agency
410 Severn Avenue
Annapolis, Maryland 21401 (301) 266-6873

U.S. Army Corps of Engineers
Baltimore District, P.O.Box 1715
Baltimore, Maryland 21203 (301)962-3670

National Marine Fisheries Service
Oxford Laboratory, Railroad Avenue
Oxford, Maryland 21654 (301) 226-5771

State Agencies

Maryland Department of Natural Resources
Coastal Resources Division (301) 974-3767 or
Fisheries Division (301) 974-2241 or
Forest, Parks & Wildlife Service (301) 974-2035
Tawes State Office Building
Annapolis, Maryland 21401

Maryland State Department of Education
Environmental Education Coordinator
Division of Instruction, 200 W. Baltimore Street
Baltimore, Maryland 21201 (301) 333-2312

Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224 (301) 631-3003

Maryland Department of Agriculture
50 Harry S. Truman Parkway
Annapolis, Maryland 21401

Virginia Council Of the Environment
903 9th Street Office Building
Richmond, Virginia 23219

Virginia Department of Forestry
P.O.Box 3758
Charlottesville, Virginia 22903

Virginia Department of Health
109 Governor's Street
Richmond, Virginia 23219

Virginia Marine Resources Commission
P.O. Box 756, Newport News, Virginia 23607

VA Game & Inland Fisheries Commission
P.O.Box 1110 Richmond, Virginia 23230

Pennsylvania Department of Agriculture
2301 North Cameron Street
Harrisburg, Pennsylvania 17110

Pennsylvania Department of Education
Office of Environmental Education
333 Market Street
Harrisburg, Pennsylvania 17126-0003

Pennsylvania Chesapeake Bay Program
Education Office, 225 Pine Street
Harrisburg, Pennsylvania 17101

Pennsylvania Fish Commission
P.O.Box 1673, Harrisburg, Pennsylvania 16105

PA Department of Environmental Resources
P.O. Box 2063 Harrisburg, Pennsylvania 17120

Citizen Organizations

Chesapeake Bay Foundation
162 Prince George Street
Annapolis, Maryland 21401 (301) 268-8816

Alliance for the Chesapeake Bay
6600 York Road, Suite 100
Baltimore, Maryland 21212 (301) 377-6270

Save Our Streams
263 Scotts Manor Drive
Glen Burnie, Maryland 21061 (301) 448-1979

Other Educational Resources

The National Aquarium In Baltimore
Department of Education and Interpretation
Pier 3, 501 Pratt Street
Baltimore, Maryland 21202 (301) 576-3800

Mid-Atlantic Marine Education Association
4548 Bob Jones Drive
Virginia Beach, Virginia 23462 (804) 642-7172

Izaak Walton League of America
1401 Wilson Boulevard, Level B
Arlington, Virginia 22209 (703) 528-1818

Assistance With Environmental Concerns

Recycling

Maryland Environmental Service (MES)
Recycling Information Center
2020 Industrial Drive
Annapolis, Maryland 21401 1-800-492-9188

Maryland Department of the Environment
Office of Recycling & Waste Minimization
2500 Broening Highway
Baltimore, Maryland 21224 (301) 631-3315

Environmental Action Foundation
1525 New Hampshire Avenue, NW
Washington, DC 20036 (202) 382-4610

Environmental Task Force
1012 14th Street, NW, 15th Floor
Washington, DC 20005 (202) 842-2222

Keep America Beautiful, Inc.
9 West Broad Street
Stamford Connecticut 06902 (203) 323-8987

National Recycling Coalition
P.O.Box 80792
Lincoln, Nebraska 68501 (402) 475-3637

Toxics

Household Hazardous Materials Hotline
Maryland Department of the Environment
(301) 631-3790

Soil

U.S. Soil Conservation Service
Earth Team Volunteer Program
339 Revell Highway
Annapolis, Maryland 21401 (301) 757-0861

To get the number for your **Soil Conservation District**, call (301) 841-5863

Water Quality

Chesapeake Cleanup Campaign
Department of State Planning
301 West Preston Street
Baltimore, Maryland 21202 (301) 225-4550

Maryland Department of Natural Resources
Tidewater Administration Monitoring Program
(301) 974-3767

Save Our Streams
263 Scotts Manor Drive
Glen Burnie, Maryland 21061 (301) 448-1979

Maryland Department of the Environment
Office of Environmental Programs
Water Management Administration, Room 209
2500 Broening Highway
Baltimore, Maryland 21224 (301) 631-3603

MORE "Numbers To Know"

for other Bay information

Department of the Environment
Barbara Castle Johnson (301) 631-3003

Department of Natural Resources
Helene Tenner (301) 974-3382

Department of Agriculture
Louise Lawrence (301) 841-5863

Department of State Planning
Edwin L Thomas (301) 225-4500

Chesapeake Regional Information Service
a service provided by the Alliance for the
Chesapeake Bay
call **1-800-662-CRIS**

